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CONTENTS

The Eighty-Five Per Cent, *by Dewey F. Barich* 215
Vitalizing Printing by Means of a School Museum, *by Russell Landis* 217
Diversified Occupations Co-ordination, *by Charles W. Lombard* 219
Publishing and Printing, *by R. Randolph Karch* 221
The Relation of Industrial Arts to the Vocational Program, *by Rollin Kennerly* 223
Practical Psychology in Our School Shops, *by John E. Crawford* 224
The High-School Broadcasting Club, *by K. C. Skeen* 228
Significance of Foreign Production Drawings in the School Drawing Room, *by A. K. Rigast* 229
Co-ordination, *by Earl M. Bowler* 231
The Boy at the Bench (poem), *by Adam N. Reiter* 231
Sources of Strength, *by Dean M. Schweickhard* 232
Editorials 233
The Builders (poem), *by A. C. Phillips* 242

Testing and Tests

Standardized Industrial-Arts Test, *by Robert P. Jensen* 234
Final Examination for Industrial-Arts Woodworking Classes, *by James F. Ahlbach* 235
Tests on the California Type Case, *by E. V. Ahonen* 242

Problems and Projects

Casting Bait, *by W. A. DeVette* ..... 237 and 243
Wood Screw Chart 239
Two Hollow Surfboards, *by James McGregor* 243
Wall Scissors Case, *by Raymond L. Harrington* 244
Classical Bluebird House, *by Earl W. Boyer* 245
A Kitchen Stool, *by Leon A. Orr* 246
Spiral Reamer, *by Edwin M. Moe and W. Harold Bugg* 246
Good Design for Wood Turning, *by Bert Carr* 246
Clamping a Leg to a Turned Post, *by Thomas L. Hutchinson* 247
Electric Cord Rack, *by F. W. Dejmek* 247
Exercise Blocks for Teaching Mechanical Drawing, *by W. W. Sturtevant* 247
Electric Candle, *by Paul Bell* 248
A Peculiar Grain Effect, *by James A. Fenn* 248
Tools for Shaping Glass, *by Milton Berlanstein* 248
Designing with a Fifteen-Cent Spray Gun, *by R. H. Jenkins* 250
Plaster Casting Made Easy, *by Leland A. Benz and Lawrence F. Simmering* 250
Handy Sorting Pad for Small Nails and Brads, *by Frank Bentley* 252
A Simple Tanning Method, *by W. Ben. Hunt* 252
Rules for the Finishing Room, *by Eugene W. Frank* 253
Presswork Procedure, *by John Brophy* 254
Cross-Section Paper for the School Shop, *by H. R. Buros* 254
Countersink, *by C. W. Blakeslee* 254
Printing Teachers Meet for Discussion of Mutual Problems 255
Making School Corridors More Attractive, *by Francis J. Coyte* .. 256
Answers to Questions 256
Personal News 256
Association News 11A
Shop Equipment News 12A
New Publications 17A

THAT NEW ADDRESS

Readers who are going to change their positions prior to the appearance of the September issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION (about August 15) are kindly requested to notify our circulation department as soon as possible. In this way they will be sure of receiving their September number promptly.

TO OUR READERS

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION hereby extends best wishes to all shop teachers, supervisors, principals, directors, and others interested in any phase of industrial arts and vocational education, for an enjoyable and healthful vacation.

THIS MONTH'S COVER

The picture chosen for this month's cover is entitled "The Printer" and is taken from a woodcut used in Jost Amman's *Book of Trades* published in 1568. Bettmann Archive, 145 West 44th St., New York City.

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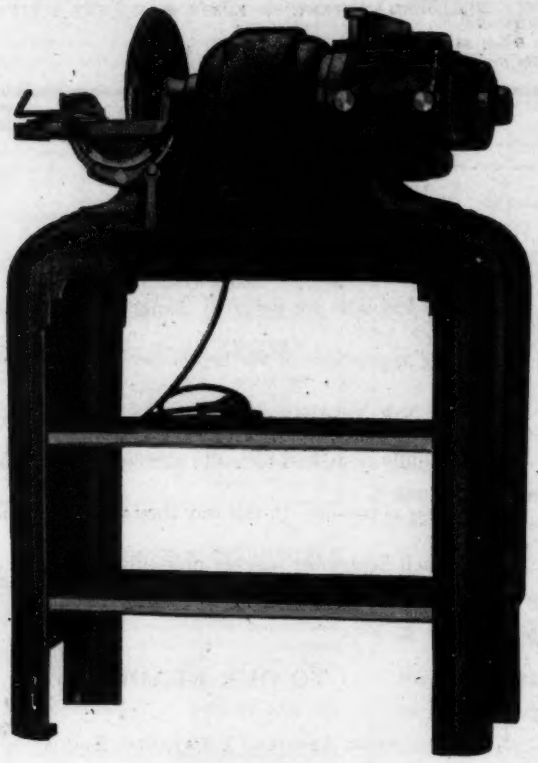
SAFE • HEAVY • STRONG



W-90 95 SANDER

Begin the new term with one or more of these versatile sander combinations in your shop. There is still plenty of time between now and September to arrange for installation.

Both student and teacher benefit from its many advantages. The belt sander produces a smooth, professional finish on wood and metal . . . and on the newer, widely used plastics. The ends of the table conform to the shape of the rolls . . . adjustments are easy to make . . . front roll is cushioned with rubber . . . dust hood is highly efficient.

The disc sander unit is designed to perform a wide variety of accurate operations such as finishing, squaring, mitreing, fitting and grinding. With proper abrasives, can be used to finish metals, plastics and ceramics. Furnished with an unusually handy mitre gauge. Table tilts 45° either way and can be locked in any position. Has a heat-treated, nickel-alloy, cast-iron disc which is scientifically balanced and true running.

To meet your individual requirements this machine may be ordered with a W-80 Grinder unit instead of either the disc or belt sander. Whichever combination you select, you are sure to find it to be one of the most useful and versatile additions you have ever made to your shop equipment. Write now for complete information.

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

Short Talks on Wood

AMERICAN ELM (*Ulmus americana*)

Also known as the White Elm. A front rank forest tree although generally regarded as a shade tree by most people. The wood is heavy, hard, strong, straight-grained and tough. Shrinks moderately, holds fastenings well, takes a fine polish and is one of the best woods for bending. Reddish brown in color.

Formerly used extensively in the manufacture of automobiles and refrigerators. Has now been forced to seek other markets and is being used for trim, fixtures, upholstery frames, boats, flooring and cooperage.

Range extends from Newfoundland west to the Rocky Mountains and south to Florida and Texas. Grows on almost any soil, but shows some preference to the moist ground along streams and rich bottomlands. Grows rapidly and is long-lived. Ideal for street and park planting.

A large tree which often reaches a height of 70 to 100 feet and a diameter of 2 to 4 feet. Commonly divides 10 to 25 feet above ground into a few large graceful branches which rise to give the tree its characteristic vase-shaped crown. One of the most beautiful of all American trees.

The bark is thick, firm, grayish-brown and becomes rough and deeply furrowed on old trees. The leaves are simple, alternate, 4" to 6" long, double-toothed on the margin and are somewhat one-sided. The veins are very pronounced and run in parallel lines from the midrib to the leaf-edge.

This is the eighteenth of a series of brief articles dealing with various woods, their properties and uses. It is our hope that they might make interesting and helpful classroom material. We will welcome your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

June, 1940
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The Eighty-Five Per Cent

Dewey F. Barich

Supervisor of student training and teacher training in general shop, and home and farm mechanics,
Central State Teachers College,
Mt. Pleasant, Michigan

A description of what one community is doing to prepare its students to assume their future civic responsibilities.

Much has been written and said about the 85 per cent of our high-school graduates who have been prepared to go on to college but for various reasons never got there. Many studies, national, state, and local, indicate that a very small percentage of boys and girls graduating from our high schools annually, pursue a college education. A smaller percentage graduate from institutions of higher learning.

On the other hand, these same studies reveal that the objective of the curriculum in the high schools was, primarily, college preparatory. Following, is a quotation from a study made in one of the large automobile manufacturing cities in Michigan. "In June, 1936, a total of 907 college preparatory and general curriculum students graduated from two high schools. On February, 1937, another 107 were graduated from these curriculums, making a total of 1,014. Out of this number, it was discovered that *only 276 actually went to college or 27.2 per cent.*" The reader may guess how many of these actually graduated from their respective colleges. A recent news item, broadcast over a national network, emphasized one part of a report on a survey conducted by the National Youth Administration in which 25,000 unemployed high-school graduates, representing all sections of the United States, were asked why they were, most often, turned down by employers. A large majority said they lacked practical experience and followed it up with the remark — if I had taken work in the vocational courses, my chances of getting a job would be much better. Many state legislatures have had or will have an opportunity to vote on state apprentice laws. The laws need to be drafted because the cry is heard the country over that there is a shortage of skilled labor. It is evident that those in whose hands lies the destiny of our educational forces must take heed of the criticism of our educational system or be content to let some other agency do the work. To show what school systems, who have accepted the challenge, are doing to alleviate these conditions, the writer hereby offers a description of the vocational-education and industrial-arts program in the public schools of Trenton, Mich.

This community, located in the greater Detroit area, may well be proud of its board of education, its school administrators, for their foresightedness in adding vocational-education and industrial-arts units to their high-school curriculum. Following is a descriptive outline of the study preceding the recommendations for the new vocational-education and industrial-arts unit, the recommendations, the program as it is functioning, and several illustrations to show the physical setup in the classes where this work is given.

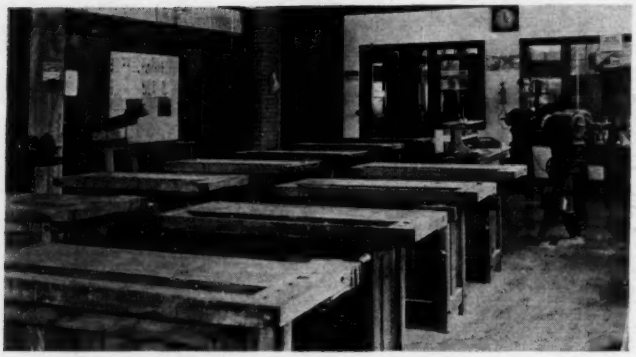
A study of the graduating classes, 1932 to 1937 inclusive, disclosed the following important facts: Of the total memberships of the high-school classes, 20.8 per cent entered higher institutions of learning. The survey also revealed that a large majority of those not going on with formal education were living in the community and working in the various industries of this area. The large industrial concerns within computing distance of this area are, Ford Motor Company, Detroit Edison, Firestone Rubber Company, Michigan Steel, Great Lakes Steel, Great Lakes Boat Works, and Sulphite Process Paper Company.

Further examination of the data gathered, clearly indicated that the school was not giving adequate preparation to that large group who want "a place in their community including a not-too-far distant job." The findings of this study was convincing evidence that the traditional curriculum was not giving to the majority of those attending school the kind of training that would assist them in earning a livelihood. This problem was faced by approximately 80 per cent of these graduates.

Definite action was proposed. Other school systems were studied. The state department of vocational education rendered their services freely. Students were interviewed for their vocational interests. Community interest was aroused which culminated in the form of a petition sanc-

A view of the drawing room

A view of the graphic arts shop



A view of the new woodwork shop

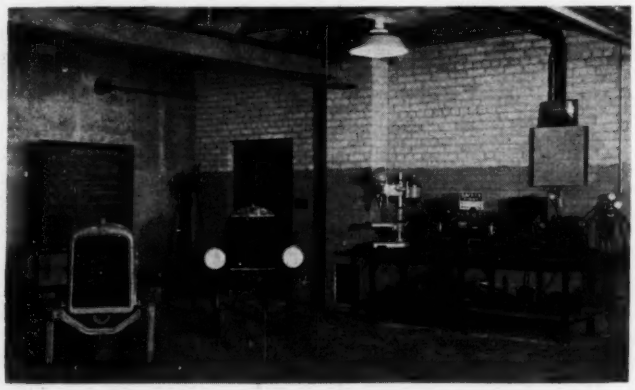
A view of the mill room in the woodwork shop

tioning the proposals of the school executives.

These preliminary efforts were responsible for a new addition to the high school, housing an auto shop, a metal-trades shop, a woodworking shop, a graphic-arts shop, an electrical laboratory, a drawing room, and two classrooms. The auto shop is equipped with the latest tools and testing devices for training in motor tuning, overhauling, repairing, paint spraying, service work, and general consumer knowledge for the automobile owners and prospective owners. The metal-trades shop is very adequately equipped with five machine lathes, shaper, drill press, metal saw, an area for foundry practice in nonferrous metals, melting furnace, heat-treating furnace, forging furnace, two acetylene-welding and cutting stations, 200-ampere D.C. welding machine, 150-ampere A.C. welding machine, an electric spot-welding machine, grinder, and the usual sheet-metal machines, consisting of: squaring shear, forming rolls, ring and circle shear, combination bar folder and cornice brake, and a standard with the various forming machines. Plans call for additional machine-shop equipment — milling machine and grinder. The woodworking equipment includes a joiner, band saw, planer, table saw, sander, three wood-turning lathes, tool grinder, drill press, and shaper.

The graphic-arts shop is equipped with a power platen press, small hand platen press, paper cutter, proof press, and adequate supply of type and hand tools. The drawing room has a blueprinting machine, and individual drawing tables each equipped with a complete set of drawing tools.

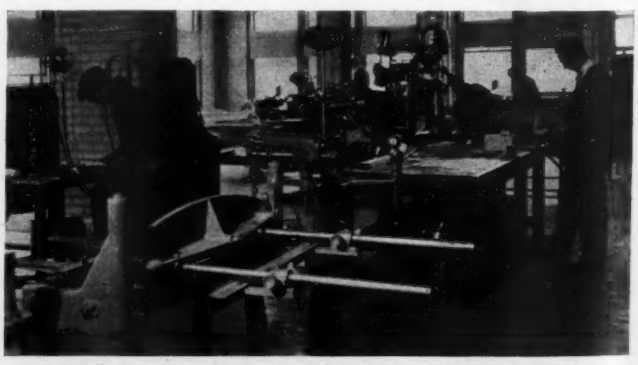
Auto-mechanics and metal-trades classes operate under the Smith-Hughes plan. The shop periods are three hours with an additional hour of related work. The boys also get one hour of English. The remaining hour is taken up in physical education, civics, or economics. All students in these classes must be at least 15 years of age, and have completed the ninth grade in school. To say the boys are enjoying their work would be putting it very mildly indeed. Within the first six weeks of school, we had an opportunity to send out one of the boys to do some acetylene cutting. A



A view of the vocational auto mechanic shop

Another view of the vocational auto shop tool room and testing equipment

A view of the forging, heat treating, foundry, and arc welding areas of the metal trades shop



A view of the sheet metal and acetylene welding areas in the metal trades shop

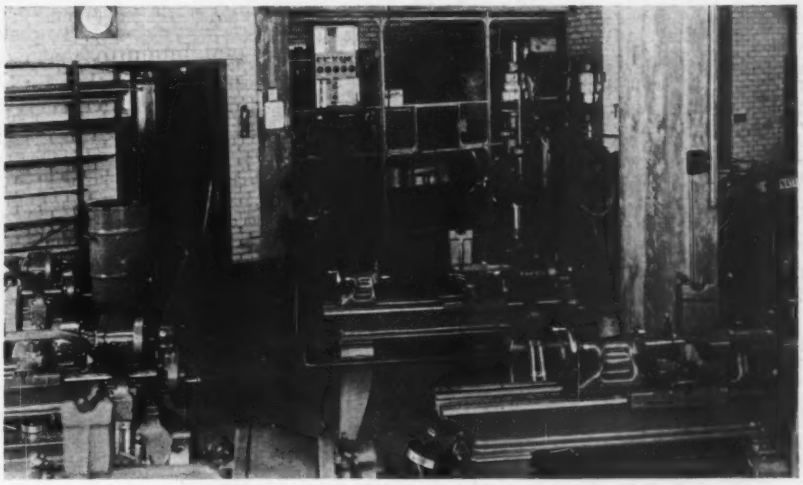
short time later, he received his check — the event, trivial to some perhaps, but a genuine thrill to the boy, his associates, and his instructor. Yes, a thrill that comes only from the joy of accomplishment. Those of us in this department are especially proud of the following remarks made by Dr. Frank Dalton, state supervisor of trade and industrial education: "The machine shop and auto-mechanics shop are in excellent condition. This probably represents one of the finest small vocational schools in the State of Michigan. The program is proceeding very satisfactorily. Vocational education has received some real momentum in this community."

The other shops and drawing classes, under the expanded program, are offered on the industrial-arts basis — a part of the general education program. Industrial-arts work will be required of all boys in the seventh and eighth grades, and it is elective in the ninth grade and throughout senior high school.

What about the girls? What is offered to parallel the opportunities given to the boys? Classes in homemaking, home economics, and in the various types of commercial work fulfill the present need in that direction.

We are happy to have a small part in fulfilling this forecast made by Dr. Edwin A. Lee, in his book, *Objectives and Problems of Vocational Education: "There will be an acceptance of a common creed* by all those engaged in vocational education of every kind and grade. This creed they will hold in common also with the progressive educators who are so earnestly engaged in the reform of general education. However it may be phrased, this credo will cover all such declarations as this:[1]

[1]Prosser and Allen, *Have We Kept the Faith?* The Century Company, New York City, pp. 154–156.



A view of the machine shop area and tool room of the metal trades shop

THE CREED OF THE PROGRESSIVE EDUCATOR

"1. I believe in the common man.

"2. I believe that education is primarily for the social well-being of this democracy and not for individual benefit.

"3. I believe also in the necessity of widespread intelligence among all citizens.

"4. I believe that a trained citizenry guided by trained and capable leaders is the life saver of democracy.

"5. I believe that the main purpose of education in a democracy is to prepare all its people for the duties and responsibilities of every grade of citizenship.

"6. I believe that the ordinary man needs educational service as much as the 'superior man' and that he is just as much entitled to it.

"7. I believe that education is primarily preparation for the duties of life, that it is life.

"8. I believe that education is primarily training for thinking and doing (things) in some socially useful way.

"9. I believe that there are many forms and kinds of education for training the interests and abilities of many different kinds of people — all of whom are worth educating.

"10. I believe that everyone can and should be educated so that he can work for himself and for society.

"11. I believe that the educator is responsible both for the individual and the social results of his work.

"12. I believe that education must be constantly adapted to the changing demands of life and should therefore never be dominated by tradition or by the mere voice of authority."

Vitalizing Printing by Means of a School Museum

Russell H. Landis

Charleston, Illinois

A commercial museum is usually thought of as a place one visits to view exhibits enclosed in glass cases with numerous signs warning the spectators "Do Not Touch"; "Do Not Lean On the Case" and others of similar import.

While having definite educational values, this type of museum is not comparable to the school museum in instructional possibilities. Many school subjects have opportunities for museum materials, but printing, because of its high correlation with other schoolwork, has advantages beyond those of most other subjects.

A museum of the printing arts should serve not only the printing students, but the entire school. It must be both interesting and informational. Conducted on a basis of service to the greatest number of students, the museum will prove valuable in:

1. Furnishing vocational information about the printing industries.
2. Developing an appreciation of the contribution of the printing arts to the progress of civilization.
3. Developing an appreciation of the present value and importance of printing and allied industries in the economic life of our country.
4. Developing an appreciation of fine printing and the products of printing — books, magazines, newspapers, art posters, and the like.

A helpful suggestion which also might be adapted to other school shops.

5. Correlating printing with other subjects, as: English, journalism, history, art, and others.

The most effective school museum must be *alive,* not *dead.* It should have its exhibits changed, added to, or renewed at frequent intervals. It is necessary to have various types of exhibits available as needed by other classes or as the printing

course demands. An exhibit erected at the beginning of the year and kept unchanged for the rest of the year loses its meaning and interest. It becomes merely an exhibit, not an instructional device.

The location of the museum is most important. Local limitations of space and equipment may decrease the effectiveness of the museum, but the following standards of location must be considered:

1. The museum should be easily accessible to all interested students or classes.
2. The museum should be so situated as to interfere as little as possible with the activities of other students or classes.
3. The museum should be so situated as to permit the proper use of all its features.

The ideal school museum of printing arts combines the features of a study room, classroom, and museum. It would be a separate room, opening upon a hall and adjacent to the printshop. There must be ample shelf room for displays which are *open to inspection and handling*. For fragile or very valuable exhibits a closed glass-door display case should be provided. Most exhibits can be mounted on panels and moved or exchanged at will. Individual lights on shelves and cases will focus attention on important features and greatly increase the effectiveness of the displays.

For the accommodation of stereoscopes and accompanying stereographs, a table should be provided. A shelf for pertinent reference books can also be installed. Finally, one wall of the room should be provided with a blackboard and a projection screen. As this is to be a vitalized, instructional school museum, facilities must be available for the projection of suitable picture materials, lantern slides, and motion pictures, for illustrating the various phases of the printing arts. Also, adequate seating facilities for this feature of the museum must be provided.

Students of the printing class should take an active part in the maintenance, upbuilding, and display of museum materials. Display panels must be arranged and grouped into definite units, a file of materials kept, and all displays labeled and cataloged. A calendar, or "date book," showing when displays should be changed or indicating requests for special features can be kept by the students to assist in planning the exhibits. The experiences of planning and cataloging, creating new exhibits, and cooperating with others for the best use of the museum, are invaluable instructional aids of which the teacher of printing should make the fullest use.

The materials used in a museum of printing arts will depend to a large extent upon the ingenuity of the instructor and his class. Models can be constructed by the class and the shop itself will furnish many objects. Many valuable materials can be secured free or at a nominal cost from manufacturers of paper, type, printing machinery, printing inks, and advertising firms. These free materials can constitute a nucleus for the development of other features.

It is desirable that the museum be not overcrowded or present so many details that the exhibits are confusing. To prevent this, it is desirable to display no more than one or two clearly defined units at a time. This arrangement also allows a more complete treatment of each unit and more frequent changing of exhibits. The units suggested herewith may be changed or added to as desired.

History of Printing

1. Language development.

Show facsimiles or illustrations of picture writing, cuneiform, Phoenician, Greek alphabet, etc.

Show by a chart the development of the alphabet, according to time elapse.

2. Printing development.

a) General historical.

Show illustrations or facsimiles of stone writing, clay tablets and tools used, papyrus, sheepskin, scrolls, manuscripts, early books, and modern books.

Make a large time chart of the historical progress of these features, also.

b) Famous men.

Show by pictures the earlier developers of printing and their products: Gutenberg, Caslon, Caxton, Baskerville, Manutius, etc.

Show also pictures of the more modern contributors, as: Franklin, Mergenthaler, and others.

c) Progress of machines and methods.

Picture the progressive development of methods and machines in printing.

Show pictures of early hand presses, bookbinding methods, etc., and their development up to present-day methods.

Secure illustrations of machines, pictures or plans of shop methods, etc.

A miniature of the original Ben Franklin press can be constructed, as can also ink balls, wood composing sticks, etc.

Make wall charts of typical type cases, full size.

3. Development of printing inks.

Trace the development of ink on a time chart.

Samples of inks of various kinds can be shown and also the ingredients used in the manufacture of ink at the present time.

Secure illustrations showing manufacture now and pictures or drawings of manufacture in the early days.

4. Development of printing rollers.

Trace the development from ink balls to the composition, rubber, and cloth-covered rollers of the present by means of drawings, advertising cuts, samples of rollers, and samples of the ingredients used in the present manufacture of rollers.

5. Type development.

Procure or make samples of early types and casting apparatus as designed by famous designers, chronologically arranged.

Show by wall charts, advertising cuts, and samples, the present methods of casting type and present styles of type.

Show facsimiles of the types of famous designers.

Monotype, foundry type, linotype, wood type, rules, ornaments, etc., can be shown by samples.

A wall chart of the world, showing sources of ingredients used in type manufacture can be made.

Hand Composition

Show the actual tools and materials used in present-day practice: composing stick, copy, leads and slugs, type and type case, line gauge, a job partly set up, the completed job tied up on a galley, proof planer, and proof of the job. Explanatory cards must accompany each item or step.

Accompanying pictures of comparative practice in bygone days will add to the interest.

Lockup

Present-day practice can be illustrated by showing the job in place in a chase ready to be put on the press.

Display separately metal furniture, wood furniture and reglets, quoins, quoin key, and type planer. Explanatory cards must accompany each item.

Charts showing different methods of lockup can be made.

Presswork; Including Proof Press

Use advertising cuts to show different kinds of presses.

Procure a wall chart to show the different parts of a platen press.

Show samples of tympan paper, gauge pins, and the kinds of printing done on presses, as: boxes, yardsticks, cellophane, cloth, color work, etc.

Show by actual samples the progressive steps in makeready and the finished product.

Display advertising cuts of proof presses.

A sample brayer can be included in the display.

Machine Composition

Procure wall charts showing the monotype, linotype, and intertype machines and samples of the product of each.

Spacebands, slugs, and matrices from linotype can be displayed.

Activity pictures showing the use of the machines, and advertising cuts showing the distinguishing and interesting features of each machine should be shown.

Pictures illustrating the historical development of the machines would be interesting.

Miscellaneous Printing Processes

Samples of the processes of tableting, numbering, perforating, punching, folding, embossing, etc., can be shown together with advertising matter illustrating the machines, methods, and interesting features of each process.

The History of Paper

The progress from Chinese paper, papyrus, and crude homemade papers, to the present-day products can be shown by drawings, slides, pictures, etc., which can be secured from books on this subject.

Recent samples of paper products can be secured from paper manufacturers.

Kinds and Uses of Paper

Samples of as many different kinds of paper as it is possible to get, preferably showing their uses in everyday life, should be procured.

A wall chart showing the kinds and uses of each type of paper can be made.

The Manufacture of Paper by Hand

A class project would be the construction of equipment for making paper by hand. This can form a permanent feature of the museum and with it actual demonstrations can be given.

Large-Scale Manufacture of Paper

Secure a wall chart of the Fourdrinier machine.

Procure an exhibit of the ingredients of paper and paper pulp in various stages, contained in glass bottles appropriately labeled.

A wall chart of the world, showing the sources of ingredients used in papermaking lends interest to the exhibit.

Slides and pictures of the manufacturing process can be shown.

Microphotos of paper, showing its structure, can be included in the display.

Books

A historical progression of books, or facsimiles of such books showing significant features of development, should be shown.

A *book-in-progress* showing steps in the manufacture and the component parts of a book can be secured. It must be adequately labeled.

Newspapers

Secure old or original copies of early newspapers; newspapers from other countries; and samples illustrating typical newspapers of the U. S. to show the development of the industry.

Pictures illustrating activities in a newspaper plant can be secured.

Chart showing the progressive steps in editing and printing a paper.

Show examples of present-day typography, color work, photography, etc., of newspapers.

Miscellaneous Printing and Paper Products

Procure and show samples of many uses of printed matter and paper products of all kinds, whether printed or not.

While the ideas suggested may seem elaborate, the extent to which they are used will depend upon the amount of money available for this purpose, the kind and amount of space available for a museum, and the interest, activity, and ingenuity displayed by the printing teacher and his students. It is hoped that the suggestions made, may lead to a wider use of the facilities of the print shop and a greater appreciation of the value of printing as a school subject.

Diversified Occupations Co-ordination

Charles W. Lombard

Murray Vocational School,
Charleston, South Carolina

While this article explains the co-ordinator's techniques applied especially in the training of auto mechanics, the same methods may be used with equal success for other subjects found in the diversified-occupations program.

The diversified-occupations program, as the name indicates, permits the school to offer training in a diversity of occupations. This is done on a part-time basis. The program is administered through the facilities of the regular high school. No more equipment is necessary than the usual school provides, except that there must be a complete selection of related material for each occupation the students are studying.

It is a cooperative program in which the school assists businessmen in training new employees. The shops of employers are used for training students in the actual occupational activities for one half of each day. The students spend two periods a day at school studying subjects directly related to their chosen occupations. The remainder of the time in school may be devoted to regular academic courses. The acquisition of occupational training does not interfere with graduation from high school.

The individual who has been chosen to oversee this program is called the co-ordinator. He is charged with the responsibility of keeping the program on an even keel, and to act as the connecting link between the school, the occupations, and the public.

The following outline is suggested for developing such a program in auto mechanics. With suitable occupational changes it also is applicable to other fields.

Steps to Be Taken in Establishing a Diversified-Occupations Program in Auto Mechanics

1. Make a preliminary survey to determine in a general way the auto-mechanics training needs in the community.
2. If this survey shows that there is a need for training, appoint an occupational committee.
3. Call a meeting of the occupational committee for the purpose of working out the details of the program.
4. Administer the program as agreed upon by the occupational committee and in compliance with the state and federal laws pertaining to the diversified occupations program.

Preliminary Survey

Do not make an elaborate survey. All that is necessary is to determine whether or not there is a need for this training. The occupational committee will assist in working out a detailed survey. If the community is small and time will permit, a personal visit to each garage for the purpose of acquiring the necessary information would be most effective. If this method of securing firsthand information cannot be used because of other administrative responsibilities, a visit to several of the car-dealer service departments and also to several independent repair shops would give a good cross section of the training needs. If the co-ordinator is well acquainted in the community much of this may be done by telephone. The business section of the telephone book or a local directory will give a listing of the garages in the community.

Occupational Committee

The occupational committee should be composed of men who are mechanics and garage managers or owners. If there are independent garages and car dealers in the community, a mechanic and an owner or manager from each of the types of organizations should be on this committee. This would mean four men and the co-ordinator. The size of the committee largely depends upon the local conditions. Care should be taken not to have a committee so large that it will become unwieldy. In some instances this should be a standing committee, but in others it might be advisable to have the membership change at stated intervals.

Duties of the Occupational Committee

The occupational committee serves in an advisory capacity. The co-ordinator should look upon this committee as a group of men capable of giving wise counsel about matters pertaining to the occupation. They should be given definite jobs to do, such as assisting in:

1. Determining the training needs of the community.
2. Selecting training agencies.
3. Placement.
4. Making a job analysis of processes to be learned, teaching points, related content.
5. Securing material to be used as related information.
6. Determining length of training period for each process to be learned.
7. Determining policy in regard to student's pay while learning.
8. Selecting students.
9. Arranging a checking system to determine the processes to which each student is to be exposed.
10. Keeping the program up to date.

The committee should meet on call by the co-ordinator. The number of meetings per year will depend upon the need.

First Meeting of Occupational Committee

The co-ordinator will have to carefully explain the fundamental principles of a diversified-occupation's program to the occupational committee. These men are not teachers but tradesmen. They are used to getting things done. If they understand fully what they are supposed to do, little difficulty will be experienced in getting them to carry out their part of the program.

The co-ordinator as chairman of this committee should prepare a written plan for each meeting. This well-thought-out plan, including the items which he needs advice about, must be concise and to the point.

It is advisable not to present too many new ideas at any one meeting. Assign definite jobs to each of the committee members so that he may become a part of the program from the very beginning.

Administering the Program

State and federal laws or recommendations pertaining to part-time diversified-occupations programs must be given priority. The recommendations of the occupational committee should be carried out when deemed advisable. The co-ordinator has full responsibility for the program and must make the final decision in regard to accepting or rejecting the recommendations of the committee. He must remember that the committee serves in an advisory capacity and that he is in no way compelled to follow its recommendations.

Student-Progress Record

A student-progress record should be kept of each student in auto-mechanics training as it enables the co-ordinator to make an accurate accounting of the practical work performed and school experiences on an objective basis.

The student-progress record includes the processes to be learned in the jobs the student is expected to do in the shop where the training is given. The auto-mechanics trade is a wide one and in larger communities is divided into many specialized branches. Because of this fact, the work experiences of a diversified-occupations student will vary with local conditions. It is advisable to determine the exact training needs in each community. Once the training needs are definitely established, a course of study to fit the needs may be developed. Comparatively speaking, it is a simple matter to hypothetically list a schedule of processes to be learned by a student in auto mechanics. However, to list a schedule of processes to be learned that a student will actually do in a given community is quite a different thing.

The schedule of processes included in this outline does not pretend to cover the entire field of training but merely serves as a basis from which to build a list of jobs that are actually experienced by the student.

Student-Progress Record
Schedule of Proceses to Be Learned

This schedule may be used in the following ways:

1. As a definite check on the jobs a student has helped on and has done by himself.
2. As a guide to determine the number of times each student has performed each operation. This will help to give him an all-round training.
3. As a definite way of determining what should be taught in the related-subjects class and when it should be taught. Subject matter directly related to the job should be given as soon after the job has been worked on as possible.
4. As a check sheet to determine the related information taught.

STUDENT PROGRESS RECORD

SCHEDULE OF PROCESSES TO BE LEARNED

Type Job	Helped on job	Did job	Related information
ENGINE			
Engine			
Wash engine			
Grind valves			
Remove carbon			
Install manifold			
Adjust tappets			
Tune engine			
Timing gear*			
Timing chain*			
Semi-overhaul			
Major overhaul			
Adjust main and rod bearings*			
Rod or main bearings*			
Engine mountings			
FUEL-EXHAUST SYSTEM			
Overhaul carburetor			
Adjust carburetor			
Service air cleaner			
Service or renew choke system			
Clean carburetor, fuel pump, gas line			
Gas tank*			
Service gas gauge			
Overhaul fuel pump			
Muffler and exhaust pipe*			
ELECTRICAL SYSTEM			
Service battery			
Battery*			
Battery cable*			
Starting motor			
Overhaul starting motor			
Renew starging motor brushes			
Starter switch*			
Service Bendix drive assembly			
Clean, adjust, and install plugs			
Clean, install, adjust points			
Time ignition			
Overhaul distributor			
Overhaul generator			
Generator brushes*			
Cut-out*			
Adjust charging rate			
Voltage regulator			
Service horn			
Service headlamp			
Repair lighting circuit			
Install electric accessories			
COOLING SYSTEM			
Flush cooling system			
Radiator*			
Solder radiator			
Overhaul water pump			
Repack water pump			
Tighten pack nut			
Install water hose			
Fan*			
Fan belt*			
Thermostat*			
Heat indicator*			
CLUTCH, TRANSMISSION, UNIVERSAL, REAR END			
Overhaul clutch			
Adjust clutch			
Transmission and clutch*			
Overhaul transmission			
Flywheel*			

STUDENT PROGRESS RECORD

SCHEDULE OF PROCESSES TO BE LEARNED

Type Job	Helped on job	Did job	Related information
CLUTCH, TRANSMISSION, UNIVERSAL, REAR END (continued)			
Install flywheel ring gear			
Universal joints*			
Overhaul universal joints			
Rear end*			
Overhaul rear end			
Replace axle shaft			
Install grease retainers in axle tube			
FRONT AXLE, STEERING, SPRINGS, SHOCK ABSORBERS			
Straighten front axle			
Front axle overhaul			
Overhaul steering assembly			
Adjust steering assembly			
Correct front end alignment			
Renew shackles			
Spring*			
Center bolt*			
Overhaul knee action			
Shock absorbers*			
Shock absorber bushings*			
Refill shock absorbers			
BRAKES, WHEELS, TIRES			
Overhaul entire brake system			
Adjust brakes			
Check brake fluid			
Bleed brake lines			
Overhaul master or wheel cylinder			
Install new brake lines			
Front wheels*			
Rear wheels*			
Install bearing cup			
Change tires			
Patch tube			
LUBRICATION, MAINTENANCE, ACCESSORIES			
Grease and oil all over			
Change oil			
Change transmission lube			
Change rear axle lube			
Lubricate springs			
Adjust oil pressure			
Oil pressure gauge*			
Oil filter*			
Overhaul oil pump			
Speedometer and cable*			
Install accessories			
BODY AND FRAME			
Polish car			
Polish plate glass			
Clean upholstery			
Window regulator*			
Remove door rattles			
Straighten fender			
Straighten body			
Fender*			
Body*			
Tighten body bolts			
Straighten bumper			
Straighten frame			
Running board*			
Battery box*			

*Remove and replace.

5. As a guide in arranging the training schedule with the employer to insure the students obtaining the maximum amount of systematic training.

6. As a check sheet when conferring with the student's employer.

7. As a guide in building a course of study for future years.

8. As a report for the state and federal offices of vocational education regarding student training.

9. As an outline to be used by the occupational committee and the co-ordinator in analyzing the trade.

Related Instruction

The job is the center of interest. Related subject matter is that material which informs the student of the *why* in doing a job. The occupational committee should act in an advisory capacity in preparing this material.

It is essential in auto mechanics, that the related instruction be tied up with actual job experiences. The trade being a service occupation presents difficulties which do not occur in jobs that call for processing or fabricating materials. The sequence of jobs an individual is exposed to is not stable. The jobs available to the worker are governed by the variety of jobs that come into the shop, which in turn is to some degree controlled by the seasons.

In order to bring about a close connection between the work experiences and the school some form of checking system should be used. A time card with a space provided for a written description of the job, is a good way to accomplish this. The co-ordinator can tell from this record just what related information a student should be taught in order to correspond with the work experience. Care must be taken to insist that the time card is made out properly by the student. The effectiveness of the program depends largely upon the accuracy of this card.

Part-Time Student Work Report

Copies of this report can be mimeographed and given to each student. They are taken to the job and made out as the day progresses. At the end of the day the foreman checks the jobs and signs them. The next day they are taken to school by the student. The co-ordinator examines them and records his findings on the individual's progress record.

These two simple records, the work report and the individual progress record, give the co-ordinator the exact information he needs to connect the schoolwork with the job experiences.

Instruction, to be directly related, must follow the work experience as soon as possible. Otherwise, though the content may pertain directly to *a* job in the trade, it is not in the true sense directly related to *the* job a student has just completed.

PART TIME STUDENT WORK REPORT

Name

Date		Time	Description of work
	H On		
	D Off		
	H On		
	D Off		
	H On		
	D Off		
	H On		
	D Off		
	H On		
	D Off		
	H On		
	D Off		
	H On		
	D Off		

H - Helped on job
D - Did job without help from other workers

Foreman's Signature _____

A modified Richard's formula will be helpful in selecting related material and determining what part can best be put over on the job and what part can best be given in school. This formula as applied to auto mechanics may be stated thus:

E depends upon M + T + A + X + J

E — represents the efficiency on the job. An individual is efficient as an automobile mechanic in proportion to his ability to acquire and apply the factors stated in this formula. E embraces the equipment, skill, and knowledge one must possess to render efficient service as an auto mechanic.

M — represents the manipulative skill required either with tools or in the control of machines. It is the doing ability.

T — represents the trade technical knowledge which is absolutely necessary for a worker to possess if he is to perform the manipulative operations in the auto-mechanics trade.

A — represents auxiliary technical information. This may be common to several trades. This represents that technical information which is in excess of that absolutely necessary for an individual to possess in order to do the job.

X — represents excess assets. It includes such items as good work habits, the ability to get along with people, job pride, and appreciation of the dignity and the value of the auto-mechanics trade to society.

J — represents job judgment. Job judgment is acquired through experience based upon a thorough knowledge of the job. It includes such factors as initiative in planning work, resourcefulness, mechanical ingenuity, and inventiveness.

Publishing and Printing

R. Randolph Karch

Technical Supervisor,
Department of Publishing and Printing,
Rochester Athenaeum and Mechanics Institute,
Rochester, New York

(Continued from page 127, March, 1940, page 156, April, 1940, and from page 187, May, 1940, Industrial Arts and Vocational Education)

LAWS AFFECTING COMMERCIAL PRINTING

Commercial printing plants need to take care what they print in the way of the usual "job printing." Customers who want affidavits, accusations, or slanderous statements in the form of handbills or throwaway newspapers should be told that the printer wants none of this type of business. If one is not sure about libelous content of commercial printing jobs, he should consult an attorney for advice before accepting the job, to prevent being concerned in lawsuits.

a) Printers should carefully consult the law in communities and state, and inquire about the federal laws concerning bingo games, other games of chance, gambling devices, punchboard printing, lotteries, and the like. It should be unnecessary to say here that printers should keep their hands clean and refuse jobs of any filthy nature, such as sexy stories, "post cards," and so-called "funny" anecdotes.

1. *Patents.* Often a printer is asked to reproduce jobs as ledger sheets, statements, billheads, and the like which bear such wording as "John Doe Co., Systematizers, Reg. U. S. Patent Office." He may do so, and feel free from trouble, if he omits the line which indicates that a certain printer did the work. The term "Reg. U. S. Patent Office" refers to the fact that the trade-mark has been registered, and in imprinting one is prohibited from using the wording or design used to identify the firm that produced the work.

Trade-marks are property rights recognized by common law. Patent rights are created by federal statute. A trade-mark is any word, or symbol used on goods to indemnify the makers or seller.

2. *Mail Fraud.* Care should be taken to see that no printing is done for those who would use the mails to defraud, or to obtain money or property by means of false or fraudulent pretenses. For such matter, sent through the mail, in the form of printed advertisements, circulars, cards, or pamphlets, one convicted may be fined no more than $1,000, or be sent to prison for five years, or both.

A $5,000 fine, or five years in prison, or both, are penalties for using the mails

for transporting obscene, lascivious, or any filthy book, pamphlet, picture, letter, writing, or print. The same fine and jail sentence is given to one who uses the mails to distribute any matter preventing conception or producing abortion.

It is against the law to use the mails for sending lottery tickets, or circulars advertising them, or any scheme offering prizes dependent in whole or in part upon chance or lot. This includes newspapers containing lottery advertisements. The fine for this is not more than $1,000 or two years in jail, or both.

3. *Ticket Printing.* Sections 500d and 1102a of the Revenue Act of 1926 require that a ticket printer shall give prompt notice to the collector of internal revenue in his district the place to which the admission is to be charged. The admission ticket tax is one cent for each ten cents or fraction thereof, *on tickets sold for 41 cents or over.* Further, it is mandatory to furnish the following information: name and address of the person to whom the tickets are furnished, the number of tickets, and proofs or sample copies of the tickets themselves. *Copy for such tickets must include,* on the *face* of the ticket, the *established price, tax paid,* and *total* (as "Admission 90 cents, tax 9 cents, total 99 cents"); or the established price and the words "tax exempt." If customers claim that tickets are exempt from this tax, a properly executed certificate of the Internal Revenue Service must be presented to the printer *before* the tickets are printed. On tickets of *less* than 41 cents, it is only necessary that the price of the ticket be shown, as "established price 25 cents, tax free." Those who willfully fail to furnish this information at the time or times required by law or regulation are guilty of a misdemeanor. If convicted, a fine of $100 is possible, or imprisonment, together with the cost of the prosecution.

Copyrights

Introduction. A copyright is an exclusive permit issued by the government to grant authors, artists, photographers, etc., the sole right to publish their productions for a 28-year period, which may then be renewed for a like period. Copyright laws became effective in the United States in 1790, and since then several amendments provide that the following may be copyrighted:

a) Books — composite and encylopedia, directories, gazetteers, and compilations.
b) Newspapers.
c) Magazines (periodicals).
d) Sermons, lectures, and addresses prepared for oral delivery.
e) Maps.
f) Musical compositions.
g) Dramas and dramatic musicals.
h) Art work, and reproductions of art work.
i) Drawings and prints.
j) Photographs and moving pictures.

Those who secure a copyright on any of the above have the right, under law, to print, reprint, publish, copy, and sell the work. They can also translate it, novelize it, and arrange and adapt it if it is a musical work.

For a copyright in the United States a printed piece must be set, in type, printed, and bound within the limits of the United States. If the job is electrotyped or stereotyped, this work must also be done in the United States. This does not apply to foreign books or in a language other than English.

1. *Securing Copyright.* The Register of Copyrights, Library of Congress, Washington, D. C., provides certain types of cards which cover the various copyrights issued. These cards are filled out after publication, notarized, and sent to the Register of Copyrights with a postal money order or bank draft for two dollars. Two copies of the best edition must be sent also. The printed book must carry the copyright notice: Copyright 193— (or Copr. 19—; or C in a circle) by (publisher's or author's name, as given on the card). The two copies are deposited in the Library of Congress. The copyright owner receives a certificate of registration, signed and sealed. Fees vary with the items copyrighted: unpublished works, one dollar; published photographs, fifty cents, etc.

2. *Protection.* Manuscripts are not allowed to be copyrighted in advance of publication. They are, however, protected under the common law against unauthorized use in whole or in part up to the actual time of publication. (Common law is that which does not rest its authority on any legislative act — the unwritten law — consisting of rules and principles from reports of adjudged or judicially decided cases, and from popular custom and usage.)

Anyone who uses copyrighted material without permission and proper credit may be forced to pay penalties to the copyright owner, which may be as high as one dollar per copy sold.

3. *International Copyright.* The international copyright is the arrangement made by different countries where items are protected in any of the various countries belonging to the copyright union. In the United States, a copyright is granted to a foreigner only if he lives in the American union at the time of the first publication, or if the country of which he is a citizen gives similar provisions to American citizens.

4. *Newspapers* and *periodicals* may be copyrighted, day by day, at a cost of $365 a year, to protect all of their original matter of literary value. There is no provision for copyrighting the news, although such bills have been presented to Congress.

5. *Penalties.* Damages and all profits made can be granted the copyright owner. In the case of a newspaper reproduction of a photograph, the minimum is $50, and the maximum $200. For infringements, the law provides that the person shall be liable to an injunction restraining such infringement, and to pay the copyright owner damages suffered due to the infringement; also all profits.

Suits are held in circuit and district courts, with appeal or writ of error to the circuit court of appeals, and finally to the supreme court of the United States. Criminal proceedings cannot be brought after three years have passed from the time of the offense.

Violation of copyright is called a misdemeanor, and is punishable by a fine of not less than $100, and not more than $1,000. It must be proved, of course, that a person has inserted or impressed any notice of copyright, or words of the same meaning, with fraudulent intent, in or upon any uncopyrighted article, or shall alter the copyright notice on any article duly copyrighted.

6. *Cases.* A typical case of copyright difficulty concerns that of the *Houghton Mifflin firm* v. *Stackpole Sons* and the Harrisburg *Telegraph Press.* On June 9, 1939, the United States Circuit Court of Appeals handed down an opinion for an injunction against the defendants. The Court decided that "the book in question was subject to copyright and was properly copyrighted in this country." Upon mandate from the Circuit Court of Appeals the United States District Court for the Southern District of New York enjoined Stackpole Sons, Inc., its directors, officers, agents, and employees, during the pendency of the action, "from directly or indirectly publishing, printing, reprinting, translating, copying, distributing and offering for sale a certain copyrighted work entitled *Mein Kampf,* by Adolph Hitler, and from in anywise infringing the copyright on said work." This means that the publisher cannot sell the book, nor can the booksellers, including all stock on hand. The District Court will no doubt assess damages against the defendant. The defense was that Hitler was stateless at the time the copyrights were issued, and that the plaintiff never acquired title to the copyrights.

The United States Supreme Court, on October 23, 1939, refused to interfere with the lower court ruling that whether or not Adolph Hitler was a "stateless" person when he wrote *Mein Kampf,* the Houghton Mifflin Company owns a valid American copyright of the book, and upheld an injunction against Stackpole Sons, Inc., and the *Telegraph Press* from publishing a version of the work.[10]

7. *Publisher's Ownership.* The publisher of a book wants to own the copyright, usually, on the work for his own protection, because he has much cash tied up in producing the book. Further, this protects him from the author who may want to take the book away to have it published elsewhere. He can do this if he owns copyright. The agreement signed by both the publisher and the author protects the former from any piracy on the part of the author. In the case of a violation of copyright, the author and publisher would no doubt be sued jointly, and the publisher, in turn, would sue the author to make sure that the author would pay the bills for both

[10] *Editor & Publisher,* October 28, 1939, p. 8.

parties. The printer's hands are clean in a mess of this sort.

8. *Mimeograph Stealing.* Very often, in schools especially, some portions of a book will be mimeographed or otherwise reproduced by the teacher, who then provides the class with the material. This piracy can be stopped if the publisher knows where it is going on and is ready to bring suit.

9. *Plagiarism* is the act of appropriating the ideas and language of another and claiming them to be one's own. When this act becomes piracy, the guilty party may be enjoined if the original matter has been copyrighted.

10. *Layouts.* Although layouts are not copyrighted, the printer is protected in their use from unethical customers. If layouts furnished by a printer are marked as his copy, and the customer gives the layout and job of printing to another printing firm, the customer can be held for damages. Awards are on record up to $250 and costs for "steals" of this sort. All layouts and dummies should have labels attached, saying in effect:

Notice — This is our exclusive property, and it is sent to you in connection with the proposal for printing submitted to us. It is not to be shown to competitors. It is our property, and should be returned to us, unless you accept our proposal. Any unauthorized use is forbidden. Blank Printing Company, New York.

11. *How to Keep Out of Trouble.* There is little to worry about, in publishing and printing, if care is taken to see that copyrighted materials are not used without permission, as the reproduction of copyrighted material must not be so complete that it infringes upon the sale of the original matter. However, a newspaper which prints, without permission, a novel, for instance, would be liable for damages, even if it announced that the material had been taken from a copyrighted book.

12. *Permission to Use.* When copyrighted material is used with the permission of the owner, it should not be edited in any way, except to shorten it for space requirements, and then, the condensing must be done in such a way that the spirit and nature of the original copy is not altered. Whatever the errors may be, it is not the editor's privilege to correct them.

13. *Labels.* A registrable label must describe with certainty the article or goods upon which it is used. Where a label is made up of printed matter together with circles or scrollwork which are separately sold in the printer's art, but which are so combined as to produce an artistic effect, the label is registrable. But a mere title for goods printed in the ordinary type with ordinary printers' ornamentation is not registrable as a label, since it is not an artistic production, it required in its production no exercise of the creative powers of the mind, and it displays no originality in design.

The following can be protected by patent: Wrappers, cartons, tags, and boxes, on which labels or prints have literary or artistic merit. Prints and labels describe an article, while the trade-mark identifies it. These items are filed with the Commissioner of Patents, under the Copyright Law, and must bear the statutory notice of copyright.

Original and ornamental designs, such as those used on boxes, are patentable for either 3½, 7, or 14 years, at the discretion of the applicant. The patent notice and number must appear on the design.

15. *Conclusion.* When considering original matter, it is well to remember that ideas are not protected by copyright. Two persons, for example, can write a book about how to train a dog, and although they will both furnish the same facts, one must not use the exact language of the other.

A court must decide what is an exact copy, in any lawsuit. The government will not fight cases for a plaintiff. The card stating that on a certain date you deposited two books with the Register of Copyrights is a sort of "receipt" from the Federal Government, but if someone else publishes the same book, after the date of your certificate, you must take him to court to prove your case.

Abstract statements of rules and principles, as in games, cannot be copyrighted, but the way of expression of the author may be. Assignments of copyrights must be filed with the Register of Copyrights to be valid. Advertisements may be copyrighted.

The Relation of Industrial Arts to the Vocational Program

Rollin Kennerly

Hall Fletcher Junior High School, Asheville, North Carolina

Several different names such as manual training, manual arts, arts crafts, prevocational education, and industrial arts have been applied, in the past, to the phase of education we now term industrial arts. A good idea of the meaning and objectives of this form of education is given by the following definitions by authorities in this field. Haynes in his book *Teaching Shopwork*[1] defines two terms as follows:

"The term manual training, as generally used, refers to the woodworking shop work of an Americanized-sloyd type which is now so common in the elementary schools of the country. It is sometimes used also to indicate the shop work in the general high school, which consists chiefly of simple cabinetmaking projects and often includes printing and metalworking.

"Industrial arts is a more comprehensive term than manual training. It generally denotes the different types of handwork used in the lower grades, such as textile work (weaving, basketry, etc.), clay work or simple metalwork. . . . The purpose of this type of work is to introduce the pupil to the various great industries or groups of occupations of mankind as a matter of general education without either vocational or prevocational motive."

Payne[2] on page 24, in his book *The Administration of Vocational Education* quotes from the 1906 Report of the Massachusetts Industrial Commission as follows:

"Manual training has for its objective general education. The education of the mind in part through the hand. Its motive is educational not vocational. If properly carried on it gives the pupil a general acquaintance with mechanical and constructive activity and it may make a pupil generally handy, but it does not go farther."

Snedden[3] in his book *Vocational Education*, page 549 states:

"Industrial arts education includes those forms of training and study based upon industrial pursuits and designed to enhance the general intelligence and give vocational guidance in the field of industrial occupations."

The value of industrial-arts work in preparing the student for future vocational courses.

On page 579 this same author states:

"Prevocational education includes any form of education designed to enable a youth to discover for which one of the several possible vocations he is best fitted by natural ability and disposition. The program of instruction and practice is based mainly upon actual participation in a series of experiences related to many vocations."

Griffith in his book *Teaching Manual*

[1]Ginn and Co., Boston, Mass., p. 7.

[2]McGraw-Hill Book Co., New York, p. 24.

[3]The Macmillan Co., New York, p. 579.

[4]The Manual Arts Press, Peoria, Ill.

and Industrial Arts[4] is a little more inclusive and gives a somewhat different idea in his definition as follows:

"Manual arts, manual training, arts crafts, are those forms of training and study selected from industrial pursuits best calculated to afford boys and girls a fundamental means of natural development of socially and individually desirable qualities."

The objectives of industrial arts, as shown by the foregoing definitions, have two main purposes; namely, the increase of general education and as a means of vocational guidance. General educational objectives of industrial arts that are outstanding are to give training in and to develop the qualities of neatness, accuracy, citizenship, character training, cooperation, patience, perseverance, worthy home membership, worthy use of leisure, to furnish information in regard to production and distribution, to enable pupils to appreciate the significance of these arts in racial development and to utilize the products and institutions produced by the arts wisely and efficiently. In addition, a very important objective of industrial arts is the educational and vocational guidance values of the knowledge and experiences gained in regard to the industries and industrial work.

The objective of the vocational program is to give training for specific occupations after a choice of occupation has been made, the training is intended to fit individuals for profitable employment. Training or education is not considered vocational unless it is to be used in some occupation or profession. To be effective, the training must be given to persons who want it, need it, and can profit by it.

There are two major aspects of the problem of transmitting to the succeeding generation the practical arts of the race; namely (1) training all the young to understand these arts for purposes of appreciation and for the intelligent use of their products, and (2) training the new generation to practice the practical arts as vocations. In industrial arts in the high school the emphasis may well be placed upon the technical or scientific aspects of shop and drawing work rather than on the skill aspects. In vocational or trade schools, the emphasis must be on the skill in the operations of the craft, and careful attention must also be given to related English, mathematics, and other subjects which a first-class tradesman must know in order to practice his vocation.

Industrial-arts groups are not usually selected ones but later slope off by election by pupils. Trade training, on the other hand, should be given only on the basis of fitness and need. The tendency to make dumping grounds of trade schools is defeating and has no real argument to support it. One should be permitted entrance to a preparatory trade school when his general ability, his mechanical aptitude, and his industrial interest have been demonstrated. An adult should be permitted extension courses when both the need and the ability to profit can be rather easily established. The aim may be industrial arts for every boy and specific trade preparations for carefully selected individuals in the numbers demanded.

An industrial-arts program is relatively self-contained; it is not under any powerful obligation to cooperate with agencies outside the school. A trade-training program, however, that attempts to be self-contained and inclusive will fail in its purpose. It must have a continual proximity to outside agencies of many kinds and for many reasons. The whole vocational-training concept is based squarely upon a well developed plan of cooperation.

Some training in an industrial-arts department is well worth while for any individual to add to his general education regardless of the vocation he may enter. It gives broad industrial training needed by every intelligent citizen. The training may also be valuable for vocational-guidance purposes. The choice of an occupation is a very hard and serious problem for any individual to solve. It is too hard and serious for the average adolescent youth to solve without some guidance and tryout experiences. Tryout courses should help an individual to determine whether he would like to choose shop or industrial work for a vocation and, if so, the phase of work in which he would like to specialize. After the tryout courses the preferred phase of work can be studied more intensely in the industrial-arts department for at least one year before entering the vocational shop. This will give additional time and opportunity for the individual, and also the advisers, to determine if the proper choice has been made both in regard to likes and fitness. The setup for vocational training in most cases is expensive and every effort possible should be made to be sure pupils entering the training are fitted for it and are definitely preparing for the trade.

The two fields, industrial arts and vocational education, are similar yet different. They must continue to grow together even as they grow apart. They are and must be one. It remains for the teachers in these two fields to become more conscious of their respective limitations and possibilities. They are challenged to understand these relationships, to extend their mutual helpfulness, and to preserve their unity.

Practical Psychology in our School Shops

John E. Crawford

Perry High School,
Pittsburgh, Pennsylvania

Today's new psychology is not only scientifically theoretical; it has become seriously practical in its insistence upon the actual attainment of good mental hygiene. This new psychology has cut all connections with psychoanalysis, dream study, and belief that our heredity completely governs our lives. It asserts and emphasizes the fact that we somehow learn all the things we know, react to, and do. Our children learn to be adjusted, they even learn to be maladjusted, to life situations. How these maladjustments have been learned is less important than the fact that they all actually were learned, and were not rigidly inherited as native traits that can never be changed into better adjustment by re-education. Here is a real challenge to education.

Today's shop teachers are increasingly responding to this challenge. They are producing new course materials and books that match standard academic course materials and texts, with salient points of active student interest and real practicality. The gradual increase in vocational teacher certification prerequisites is an indication that new shop teachers are gaining higher levels of training in psychology, philosophy, and method, in addition to possessing an expert level in their own industrial fields. Their increasing number of subscriptions to the better trade and educational periodicals is also indicative of the fact that shop teachers are constantly seeking to better the educative values of their schools. And the steady increase in the general demand for shop courses — even where such industrial work has been put on an elective basis — indicates that our boys and girls find shop experience to be good preparation for life

Progressive shop teachers realize the many psychotherapic values inherent in shop experiences and are utilizing them to make their work more effective.

by living it awhile. The greatest index, though, is the gradual adoption and adaptation of shop projects and methods by other school groups, to bolster student interest and activity. All of which means that industrial education can now add its experience and its practical understanding of the psychology of child learning and adjustment, to the general high-school problem which confronts us today.

Adjustment Problems in High School

Boys and girls are baffled in many ways by their new experiences in high school. Every teacher could add examples of seemingly happy normal children who developed maladjustive reactions because they were too "upset" or puzzled by adolescent life. These adjustment problems might be briefly listed under the several headings which follow:

1. *Adaptation to new organization and administration.* It is harder for children to start in a new or different school than for adults to start work for a new company, or on a new job. Boys and girls experience many fears the first day in the new school, fears that often cause definite maladjustive reactions right at the outset. Fear never begets anything but further disabling reactions.

2. *Acceptance of new studies, different in character.* The high-school freshman is immediately up against the problem of many superimposed courses and studies — regardless of whether or not he sees their present or remote value to him. Many of these youngsters unconsciously begin to defeat their own school success, by means every teacher has witnessed. Only the docile child can get along in certain types of autocratically imposed classes.

3. *Work under highly specialized teachers.* It is hard to make the transition other than sudden from general education to specialized education. Specialized teachers have somewhat different effects on students than do general grade teachers. Boys and girls frequently are harassed by the *depth and narrowness* of their high-school courses which demand nearly the capabilities, staying power, and background of mature minds. Personality maladjustments are often rooted in this situation.

4. *New methods of teaching.* Many a high-school student is puzzled by the fact that his teachers are more expert in subject matter than in method. High-school teachers really are expert in their own subject field, but they do not always employ an expert and challenging method of "putting it over." The child who finds it very difficult to quickly adapt to these varying methods from class to class is certain to be somewhat maladjusted by this inability.

5. *Conduct under greater freedom.* Suddenly acquired freedom in the choice of habits of living and allotment of time is frequently a problem for adults. It is not difficult to realize, then, that high-school boys and girls also are confused by the problem of how and when to study, what course is best for them, how to decide what the best education is for them. Until guidance work progresses far above its present stage in the average school, this general problem of conduct under greater freedom is certain to continue to produce some maladjustment, even in our most intelligent students.

Other Problems at Adolescence

6. *The home situation.* Perhaps our boys and girls deny that they are annoyed or worried by home conditions and economics, but they do not succeed in completely hiding their annoyance and worry. "Breaking homes" have far greater maladjusting influences upon our girls and boys than definitely broken homes. Many a *problem child* has problems at home too great for him to cope with, such as bickering parents, a "triangle" at home that he is not supposed to know about, or so many mouths to feed around his table that he secretly wishes that he could quit school and help on the job, or maybe run away.

7. *The school situation.* Unless the child is an imbecile, he is likely to be seriously maladjusted by subject or grade failures. Every failure demands some kind of adjustment on the part of the student — and this adjustment may be really maladjustive in respect to his further life in the group and school. This is not an argument against legitimate or necessary failure; it is merely a statement of the fact that failure hurts the pride and forces compensation in ways that may or may not be good.

8. *The social problems.* Boys and girls are usually keenly aware of the social whirl about us. Cheated of what they may assume is their rightful part of it makes many a school child a problem child. Needless to say, the various aspects of sex are all part of this complex pattern.

9. *Ambitions, plans for the future.* Wide-awake high-school students cannot view without a qualm their gradually diminishing chances of finding adequate employment upon graduation from secondary schools alone. Prolonged anxiety of this sort lowers scholastic efficiency and general morale quite noticeably.

10. *Health, physical and mental.* Mind and body are inextricably interwoven. This means that physical ailments, especially of a glandular nature, will be reflected in neural and psychic disturbances of personality. The severity of these personality defects depends on the nature and severity of the physical lesion, and upon the degree of expert treatment given early in such cases. Boys and girls are heartlessly, thoughtlessly cruel to others who have physical or mental ailments, often causing many secondary personality defects to develop. Physical deficiencies of visual or auditory nature frequently pass undetected in many cases of *stupid and dull* children. Sometimes these children develop *queer, dull personalities* that are maladjustive.

The New Viewpoint

Many educators have come to the same viewpoint held by modern psychologist-clinicians on the problem of child behavior defects. The old disproven compartmental-faculty theory of behavior has given way to the scientifically proved theory of stimulus response. No reaction is exactly spontaneous, completely native, or inherited. All reactions, even those commonly labeled as autonomic, are learned in some fashion. Reactions and responses are therefore somewhat modifiable over a period of time, depending upon how deeply they are rooted in the autonomic and visceral organs.

A few years ago, teachers listed the more serious personality defects something like this: Heterosexual activity, obscenity, stealing, untruthfulness, truancy, impertinence, and cheating. Certainly these are not the better phases of life. But they do not have the mental deformation potentialities that certain less obvious but much more dangerous defects possess. It is easier to cope with a case of stealing than with a case of severe depression that has caused a child to withdraw from all external contacts, deep within himself to contemplate morose designs. The child who uses vulgar language can be detected and helped easier than can the child who has the same thought patterns repressed within him, out of sight and hearing, but still active and intense. Real education must eventually help that child into sane expression of his better patterns and desires, and into sane re-education of his poorer ones. Here is a challenge to the school shop.

Serious Maladjustments

Today, psychologists consider as seriously maladjustive such behavior as unsocialness, suspiciousness, depression, fearfulness, cruelty, discouragement, and easy suggestibility. These take many forms and appear in many combinations. Some of the more frequent and difficult cases to deal with are:

1. *Worry.* The serious nature of worry lies in the fact that it is a substitute reaction, and does not really reduce tension or strain in the nervous system. The very unpleasantness of worry becomes its virtue to the worrier, satisfying him temporarily that he at least is trying to solve his problem. Worry develops from the habit of procrastination; past problems left unsolved dilate into situations that are sometimes untenable yet inevitable. With no sensible way out of such a problem, children and adults alike are apt to adjust by worrying over the situation or problem. This worry tends toward a circular pattern, producing more tension which in turn demands greater worry. It is very difficult to get the worrier to see that problems need a real solution when they arise. It is at this time that they need to be met by adequate plans and execution. Break the circular worry pattern by admission of its utter uselessness. Prevent further worry by extravertive development. Otherwise, worry can generate into anxiety states that are destructive to physical health and general peace of mind.

2. *Anxiety.* Worse than worry, anxiety is much deeper in the system, less acknowledged or sensed by the sufferer, so vague and evasive in cause as to escape the aver-

age attempt at diagnosis. Developing from excessive worry that gradually spreads in area, anxiety can eventually pervade the complete personality, giving rise to many new fears besides the causing fear. Anxiety is not as common as worry among high-school boys and girls, but is the underlying factor in the majority of cases of *nerves*. It is not easy to overcome these anxiety states of irrational worry, when this anxiety stage is reached. The service of a clinician or psychiatrist is indicated in severe cases. Preventive guidance is greatly needed in all our schools to avoid and remedy these defects in boys and girls that lead so subtly into neurathenic states, and may result even in suicide. Substitution of a new, happy, extravertive routine for the old moody, intravertive habits is good treatment in these cases, but must be administered early, thoroughly, and carefully.

3. *General nervousness and irritability.* Quarreling, hypersensitiveness and minor nervous disorders such as speech defects, grow out of anxiety neurasthenia, operating as defense mechanisms against a hostile environment. Like earth tremors that indicate deeper disturbances, these general nervous disorders are merely symptoms of less tangible disorders. It is useless to try to cure such ailments as nail biting or speech impediment until the underlying problem is eliminated. Nagging at the symptom merely sets up a circular anxiety or worry pattern, thereby adding to the preliminary trouble. Boys and girls suffering from these defects grow more unhappy, depressed, and inefficient unless successfully diagnosed and treated. Too often these cases are set down as "just plain cranky." The necessary medical treatment must be paralleled by the equally needed guidance in mental hygiene, in such phases as group activity, new hobbies of an extravertive nature and active participation in games, swimming, and sports, if complete and permanent cure is to be effected.

4. *Defense mechanisms in general.* When an attitude of inferiority is in the process of formation, the person is simply learning to react with fear to criticism and to competition with others. At first, the response to criticism or competition is simple withdrawal, to escape the feared situation. But this simple withdrawal soon changes into some form of defense mechanism, an adjustment mechanism characterized by excessively aggressive conduct. Defense mechanisms often involve group participation of an undesirable or antisocial character. Sometimes the child with an intense attitude of inferiority develops aggressive traits that eventually lead him to a superior place in life. But the usual outcome of these temporarily adjustive defense mechanisms is disabling to the young person. They often reach a fixed response stage, practically defying curative treatment. Many a child who used temper rages as a defense finds his adult years in ruinous control of childish rage responses to baffling situations. Subject-matter education can never efface or counterbalance this serious personality maladjustment. Preventive guidance in early years and especially during such emotionally disturbing periods as puberty is one of the biggest tasks facing every parent and teacher. The more frequently exhibited defense mechanisms of high-school boys and girls are discussed under the following headings:

5. *Hypercompensation.* Many great advances in all fields have come through overcompensation of men and women for their felt inferiorities in other ways. But these cases represent the exceptional. Excessive compensation usually results in social inadequacy. Notice how children with facial defects often learn to make uglier grimaces at everyone who even glances at them. Very frequently, compensation functions negatively, producing further need for compensation. Every teacher knows of a dull child who demands to do things entirely outside his real capacities, thus sinking him deeper into chronic failure. But compensation can be directed into adjusting and healthful lines. The boy who is extremely poor in mathematical ability may adequately and wholesomely compensate for his thwarting in engineering work by intense art work. All such guidance must be administered wisely, to prevent later complications and personality kinks. Treatment for hypercompensation that has become disabling lies partly in a frank admission of the whole situation, and in re-education of the attitudes toward success and social service. This is as difficult to accomplish with the maladjusted youth of high I.Q. as it is in dull cases where general comprehension is too low to allow grasp of the situation. Stubborn cases of this sort are not uncommon in both ranges.

6. *Rationalization.* Boys and girls tend to make excuses for their inferiorities, instead of trying to eliminate them. These excuses frequently take the form of projection, where the child seeks to find in others his own fault exaggerated, until by comparison his own degree of defect seems insignificant. Whenever these rationalizations are general and secret, the maladjustment is particularly enfeebling, defeating all external attempts at arousing desire for improvement. Parents are often guilty of actually teaching their children this maladjustive habit of weak-spined rationalization, which carries over into adolescence and adulthood unless broken by completely re-educative circumstances. Rationalization and hypercompensation are similar in many respects, and may be similarly treated by gaining a wholesome, frank admission of all the facts and then rebuilding self-confidence and self-dependence until a normal degree of social adequacy is reached.

7. *General inferiority attitude.* With low-intelligence boys and girls who suffer frequent and increasing failure in schoolwork, the simple inferiority attitude may gradually envelop the whole personality. This severe condition causes many disabling defense mechanisms to develop, until the child is a jangled web of wrong desires and thwartings. Sometimes he becomes excessively aggressive; sometimes he becomes so despondent and unhappy that he contemplates self-mutilation or destruction. Either personality is ineffective and exceedingly maladjustive. These cases need special schools and special work, geared slow enough to permit the child to be in some way successful, instead of a seemingly complete failure. It is cruel to expect the 75 I.Q. to be happy in the 110 I.Q. group.

8. *Withdrawal, seclusiveness.* This defense mechanism has several common forms and causes. The defeated and badly discouraged child may completely withdraw from the aggravating world about him, into the less disheartening seclusion of daydreams and phantasies. His phantasy may be quite morbid, or pleasant. But as long as he keeps quiet, he is not scolded. Teacher may praise his *good behavior*, never recognizing it in an early stage of paranoid dementia praecox, with its delusions of grandeur or of persecution. Severe disciplinary treatment of hypercompensative behavior in adolescents frequently results in dangerous withdrawal. If all other defensive adjustments are denied a maladjusted boy or girl, the child naturally turns to extreme seclusiveness as a quiet and orderly defense mechanism that rarely draws down disciplinary wrath, because it is rarely viewed as dangerously maladjustive. Withdrawing thus may be habituated, spreading gradually to include the whole mental activity. The bright child becomes the moody intraverted bookworm; the dull child becomes the depressed paranoid who often seeks relief in narcotics. Active interests in extravertive play and shopwork and hobbies will help to prevent such cases, and is part of good therapuetic treatment. But the fundamental cause of the maladjustment must be discovered and treated if complete rehabilitation is to be accomplished.

9. *Negativism.* Behavior characterized by a constant active resistance, either mild or violent, to all reasonable external control situations, is really a type of distorted withdrawing. Little children find general negativism an easy and effective defense mechanism against impressed change. The word *no* is right on the tip of most little tongues; this is not dangerously maladjustive if it is only a protective device used to secure a little self-determined activity in an adult-dominated atmosphere. But when this trait persists into adolescence, it must not be lightly regarded or misdiagnosed as *stubbornness*. Negativism is really a nonadjustive emotional response of the rage type, closely related to temper tantrums. Whenever such resistance operates to release the child from unpleasant duties and responsibilities, the child learns to use the mechanism in other circumstances. Therefore, treatment lies in early development of cooperative attitudes, or

in re-education of extreme introvertive and individualistic attitudes into more socially adequate personalities.

Adjustive Shop Experience

Where the shop teacher understands the psychological implications of these maladjustments, and has the wisdom to avoid appearance of diagnostician or clinician, that shop has many psychotherapic potentialities. Every shop has great possibilities to help boys and girls out of maladjustment, into good mental hygiene. Shop experience for our boys and girls has some salient features that are not found elsewhere in the average school.

1. *Individual work.* There are many kinds of individual jobs and projects and work which are excellent to regenerate self-confidence and to stimulate self-reliance. Jobs, for example, that help a boy or girl to feel a sense of pride in the finished product are good treatment in maladjustments such as general inferiority attitude and antisocial hypercompensation. With the gradual return of genuine self-confidence and reliance, diminishing the need for substitute defense reactions, the maladjustment subsides rapidly. By careful assignment or guidance of the choice of a job with respect to a boy's needs and abilities, any shop teacher can promote adjustment of the discouraged, depressed personality. The happy, efficient atmosphere of the well-organized shop has a steadying and quieting effect on the irritable chap, and his rage response mechanisms gradually are displaced by a general problem-attacking attitude. Shop jobs that necessitate co-ordinations of mind and body are tension reducing to the *nervous* child, draining his excess energies into useful reactions that generate better social adequacy, self-esteem, and pride in skills and workmanship.

2. *Group work.* Boys and girls all like to feel that they *belong* and are *needed.* Group work in shop satisfies these basic wants in a practical way. And where a shop class is organized in such a way to provide foremen, leaders, inspectors, and specialists on an active plan, boys become better oriented and more cooperative, both by imitation or learning and by necessity. Jobs that may be carried out by several boys working as a team or squad, have many adjustive values which the psychologist-teacher can utilize in such cases as oversensitivity, worry, and projection. The incidental and concommitant learning of self-appreciation and appreciation of others eventually displaces suspiciousness, overcriticalness, and general irritability. The chap who has an overpowering inferiority attitude can find satisfactory adjustment through identifying himself with the group as a whole and its production. Personalities in general smooth off and round out, when brought into daily coordination and cooperation with others, under the skillful guidance of an instructor who knows how to group students.

3. *Production work.* Learning to "get down to a job and do it" is good educative treatment for the youth who suffers from worry and anxiety, which have their roots in procrastination and dilatoriness. Under proper management, production work can have all the good effects of individual work and group work combined. Because the shop is producing such useful and economically valuable materials, the boy has a healthy sense of usefulness and value in his work and skill, by identification of himself with the whole production squad. Naturally, the seriously maladjusted student should not be thrust too suddenly into a fast working production unit; this might intensify his nonadjustive reactions. Gradual introduction to this production type of work must be the method used in all cases, to accomplish good adjustment. Perhaps in some cases, no production level work should be attempted at all.

4. *Special work.* For cases of I.Q. ranging perhaps from 70 to 85, a different type of shopwork is needed than for normal children. Special jobs and special job sheets and instructional materials are required, to lower the threshold of encouragement and prevent inferiority attitudes that cause defense mechanisms. *Dull* minds, academically measured, can respond happily and reasonably well to a shop program definitely aimed at the actual abilities, capacities, and needs of the particular mental age involved. However, such simplified jobs must be carefully brought into the child's shop experience, to prevent development of inferiority attitudes growing out of dependency. These jobs may be gradually increased in nature and type, so that the child may eventually be weaned from such extrasimplification into more normal areas of activity. In some cases, pupils who have received this simplified preliminary work, may be fit to enter regular shop courses.

5. *Research work.* The bright boy and girl, with I.Q. above 125, wants and needs shopwork. But this shopwork must actually challenge and demand full capacities. This is seldom the case; many of these bright boys and girls take shop to get easy credits, and thereby learn to be maladjusted to real life situations in later years, expecting it all to be easy. There is no reason why all research work must be entirely confined to collegiate years or industrial laboratories. Surely there are some degrees of research of which these high-school juniors and seniors are capable. Such problems as shop management and foremanship are certainly worthy of study by these advanced students. There are many real problems in better and more economical project design that can be turned over to the right students in every shop, with excellent results to be gained in general discipline and shop efficiency. In more progressive schools, ways are found these days to specially schedule certain brighter students so they can serve as managers in lower shop sections, where their many capabilities can be better developed. Special research groups and shop clubs can serve to promote healthy competition among equally high I.Q. students. There is no danger that such grouping will produce any special personality defects; these students already know they are brighter than average, if they have any sense at all to see their obvious levels within the group as a whole. Natural leadership abilities left undeveloped or dormant will never result in a nicely adjusted life.

6. *Coeducation groups.* Boys and girls working together in high-school shops may seem impractical to some administrators, but the fact remains that such shop experiences are proving highly adjustive and balancing to students' personalities. Segregation of the sexes produces and promotes the very drives and tensions which later must be re-educated to cure their inherent maladjustment. All types of shops are not suitable for such heterosexual grouping. But such cooperative experience is part of good treatment for such maladjustment as inferiority attitude based on an inverted sex phantasy, or general sex inversion or Oedipus complex that has carried over from childhood into adolescence. Hard work on real shop jobs reduces tendencies toward false values and snobberies. A fine mutual respect for technical ability and skill grows out of boys and girls working together on shop jobs, displacing the old maladjustive attitudes of false pride, false sex superiority or inferiority. Such work provides a happy sex relationship that is decidedly tension reducing, providing those finer aspects of intercourse that are mutually psychotherapic. Some day school shops will awake to this adjustment possibility and duty to our boys and girls.

Tomorrow's Better Adjusted Youth

Practical psychology is not out of place in our school shops. There it can exercise its tenets to best advantage, to bring about mental hygiene in girls and boys. Simple cataloging of behavior defects into diagnosis is not what is needed, but rather the application of the psychology of adjustment to these defects to bring about good personality adjustment. It behooves every shop teacher to study the new psychology until he can apply it very practically in the shop, and to his own private life.

Then tomorrow's boys and girls will be happier and better adjusted in sane living. There will be fewer neuroses, and fewer phychoses. Physicians estimate that fully 60 per cent of the people seeking their services these days are suffering largely from neurotic and psychotic ailments, and that this high percentage is increasing. This warning must be heeded. We must educate our youngsters so their minds are saner and better adjusted to life, or else we can expect rapid increases in serious nonadjustive psychoses. The most important part of a watch, regardless of how fine and expertly other parts are designed and made,

is the balance wheel and escapement. Likewise, the most necessary part of all education is the development in our boys and girls of a balance, a fine hygiene of the mind, that will allow them to get the most out of life, and to do the best work for society.

School shops represent the most progressive and capable area of education these days. Shop teachers have a closer, shoulder-to-shoulder contact with students than almost any other member or members of the faculty. This strategic position of industrial and vocational education allows the shop to utilize the new psychology of adjustment to very practical ends. From a purely selfish viewpoint, that of what the general public wants from the schools, this added service of the school shop to the student should be exploded.

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There exists a veritable wealth of practical books in the field of child and adolescent psychology. The following are merely indicative of this area of education and philosophy with which every subject or shop teacher should be conversant.

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The High-School Broadcasting Club

K. C. Skeen

Faculty Supervisor of Radio Education, Argentine High School, Kansas City, Kansas

A fine club project, well carried out.

The students of the Argentine High School, Kansas City, Kans., were permitted to staff and manage the local station KCKN during the entire period between two and seven o'clock of one afternoon. This afternoon of broadcasting culminated a series of 15-minute weekly productions which the Argentine High group has been presenting during a period of two years. The students had written departmental and topical programs, and had directed and produced them, hence they entered the plans for the big afternoon with a considerable background for the task.

Previous to the actual presentation, two students were named managers for the event to determine matters of policy in procedure. Another directed the activities of a dozen salesmen, the services of the station having been donated to the school for the period, and conducted a campaign so effective that three out of every four programs produced were sold. Proceeds were added to a band-uniform fund.

Five students held complete authority as program directors, each assuming responsibility for one hour of the five. One boy was named news director to present the hourly news casts. The student sports director invited a prominent coach to appear for an evening sports revue.

Four boys and girls, with a special interest and aptitude for writing, codirected the activities of the continuity department, while two others scheduled the programs for the afternoon and ordered traffic. A senior girl, with a group of a dozen assistants, outlined an intensive public-relations campaign. Stories and pictures were provided the local press, posters were displayed in schools and public buildings and offices, civic clubs were contacted by students of the speech classes, and cooperation and information were obtained from local, state, and national leaders.

A battery of office helpers worked afternoons and Saturdays, directed by a student office manager, typing, filing, writing business letters, keeping sales records, and recording important data of every type.

Thus, activities preliminary to the actual broadcast afternoon provided an experiment in integrated activity which, heretofore, has been cultivated but little. In spite of the fact that for the past fifteen years, the radio has rivaled the influence of the press in its relation with the general public, the high schools have been relatively inactive in the field. A few scattered programs of short duration have been planned and presented by high-school students, but nothing, in the knowledge of the author, has been done which would permit of entire student direction and production.

As an example of this integrated activity, consider the boy who, in preparing a script for a recorded program, sought out his geography book, an atlas, and a world history, to provide settings for his introductions. The sales manager and assistants went to their salesmanship instructor to discuss sales policy and chart their campaign. The office force had real books to keep; real business letters to take in dictation from staff heads and type for the mails; real files to keep. Pronunciation, enunciation, diction, inflection — all became real and significant to speech and dramatic students who would appear before the microphone.

The program was themed "Airways and Folkways in the American High School," and events of the afternoon related, in some part, to the program of the school. The extracurricular schedule came into focus during the news casts through the inclusion of articles of purposeful current projects under way in various clubs and student groups. The work of the school as a public institution was included by various techniques throughout the afternoon; and, finally, during the closing hour of the broadcast, when the listening audience was estimated at near the hundred thousand mark, J. C. Harmon, Argentine High School principal, addressed the homes of the community in an informal way concerning the program and the objectives of the school.

This talk by the principal, along with a few minutes of greetings from city and school officials and friends (about twenty minutes in all), was the only part of the entire program not actually produced by high-school boys and girls. The school band and the orchestra, vocal groups, dramatics class students, speech students, school journalists, and sportsmen from the athletic department — all presented programs. These were interspersed with some three or four recorded broadcasts.

Student reaction, among both participants and listeners, was most enthusiastic. A typical comment of the former was: "I'd like to do that every Saturday"; of the latter: "I listened every minute of the five hours." Every staff member apparently sensed a keen responsibility and enjoyed working to fulfill it. Here was a real life challenge to be met, and all were eager to tackle it. In return, it would seem that each might very probably receive a more generous respect for the other fellow and his job. In general, one realizes his own inadequacies best when he is put to a practical test, and perhaps these boys and girls derived a more acute appreciation for educational values in meeting real life situations, during their five-hour radio presentation.

Significance of Foreign Production Drawings in the School Drawing Room

A. K. Rigast

Chairman, Drafting Department
Senior High School,
Sacramento, California

An experiment which always bears valuable, tangible results.

We often talk glibly of drafting as the language of industry, as *the* world language. Beginner students look at us either in amazement or indifference and without question, accept the general statement as a self-evident truth. Unfortunately we are treating our students in the same way in which we were treated by our teachers. We also accepted their generalizations without any questions and are transmitting them to our students without any further demonstration as to their validity. What concrete evidence do we have to present to our pupils which would point out to them the soundness of our axioms? If drafting is a world language, how does it compare as we teach it here in the United States with the way it is taught and practiced in other countries? Are there any similarities and differences in vocabulary, idioms, expression, grammar? If so, what are they?

To answer these questions, the writer set out to gather the necessary data in the form of foreign production drawings.

Method of Procedure

The method of procedure in obtaining the foreign blueprints was as follows: A list of names and addresses of the different foreign consuls and consuls general residing on the Pacific Coast was obtained from the San Francisco Chamber of Commerce. From this list, 24 countries were selected, which, in our judgment, would be representative of the whole civilized world.

The following letter, approved by the principal, was addressed to the different consuls of the foreign countries selected from the foregoing list:

Dear Sir:

The department of engineering drawing of the Sacramento High School is planning an international exhibit of blueprints this spring. The purpose of this exhibit is (1) to illustrate the universality of the language of industry which is the blueprint, and (2) to show the best practice of making blueprints in other countries.

For this reason, would it be possible to obtain from you a blueprint of a simple machine, or machine part, about 18 by 24 inches or less in size, showing three views of the object portrayed, and the assembly and detail representations.

Hoping that this request will receive your favorable consideration,

I remain,
Very truly yours,

Replies and promises were received from most of the consuls to whom the request was sent. A few, it should be said, paid scant notice to our request. For example, we were anxious to secure blueprints from Soviet Russia. The Russian consul general in San Francisco advised us to address our request to the Russian ambassador in Washington. We did. He in turn told us to communicate with the representative of the Peoples' Commissariat of Heavy Industry of the U.S.S.R. in New York. This we also did, but failed to receive any response. Thus this quest ended in failure. And this was one of many.

After some considerable time of waiting and sending out a number of follow-up letters, repeating the request, production drawings were received from the following countries: Denmark, Finland, France, Germany, Great Britain, Italy, Netherlands, Norway, Switzerland, Mexico, Japan, Union of South Africa, and Australia.

These blueprints represent many diverse objects such as: a large mansion, an exposition building, a double-deck bus, a large bench vise, several completely detailed motors, an internal valve, a globe valve, a water pump, an oil pump, a five-ton trailer, and many more.

Comparison of the Foreign Blueprints with American Standards*

These production drawings, with one exception, which was received from an engineering college in Norway, were sent to us by commercial firms. It is reasonable to assume, therefore, that they represent the best practice and draftsmanship in the respective countries from which they came. An analysis of them reveals many things in common with our practice. There are, to be sure, some deviations from the American standard; they are not, however, of any great consequence.

The quality of draftsmanship of these foreign drawings is of variable excellence. Some have good, clean, expressive lines, but not very good lettering, or vice versa. Others again are only fair in lines, letters, and figures. Only two blueprints, one from Mexico, the other from Italy, may be classified as excellent in every detail.

Perhaps a more comprehensive idea as to the similarities with and differences from the American standard will be obtained from a point-per-point comparison.

Visible-Object Line. This line is represented as the outstanding feature on all of the foreign drawings. This seems to be a general practice in all countries.

Invisible-Object Line. The invisible-object line is indicated on the drawings from twelve countries as a thinner, broken line, as is our practice in this country. The dashes composing it are about ⅛ in. long. The drawings from Tokio, Japan, do not show any differentiation in the weight between the solid and dotted object lines.

Center Line. The blueprints from eleven countries indicate this line by alternating long and short dashes, like the American standard. The drawings from Johannesburg, South Africa, and from Japan represent it by a fine *solid* line.

Extension Line. The drawings from Switzerland and Denmark indicate it by dashes. The general practice in the eleven other countries seem to be like ours — a *fine solid line.*

Dimension Line. Twelve countries follow our practice — a *fine solid line.* One, Great Britain, represents it by *fine long dashes.*

Cutting Plane Line. None of the blueprints from the thirteen countries indicate our practice: *a heavy broken line composed of alternating long and two short dashes.* Some represent it by *fine long* and *short dashes.* Others indicate it by a fine *solid* line.

Projection Angle. The production drawings from Switzerland, Germany, England, Johannesburg, South Africa, and Italy were represented in the first-angle projection. The drawings from the eighth remaining countries were portrayed in the third angle. This statement should be accepted with reservation, because we do not know whether the first or the third angle is used exclusively in the respective countries from which the production drawings came. Concerning this very point, Professor Thomas E. French says in his *Engineering Drawing,* 1929, p. 101: "In England some attempt has been made to introduce the more practical third angle projection but nearly all British drawings are either first angle or with the curious combination of first angle for top and front views and third angle for the side view. Holland has recently adopted third angle projection as standard, but other European countries still adhere to the older method. Canadian practice is the same as American." Professor French leads us to believe that the third-angle projection is universally used in this country, for on the same page he states that "This system, known as 'first angle projection' was formerly in universal use but was generally abandoned in this country some thirty or

American Standard Drawings and Drafting Room Practice, 1935, published by the American Standards Association, New York.

more years ago and is now obsolete." This is an overstatement of the facts. In May, 1929, the INDUSTRIAL ARTS Magazine published an article entitled "A Drafting Practice Survey," by H. D. Campbell. This study surveyed 130 large and diverse industrial concerns, and covered sixteen states: from Illinois to Alabama and from Massachusetts to California. The author found that of the 130 industrial firms 18 per cent were still using the *first*-angle projection, 63 per cent the *third* angle, 17 per cent were using *either one*, and 2 per cent were undetermined. These facts seem to invalidate the current belief that no other projection angle but the third is used in the United States.

Thread Representation. The foreign method of thread representation agrees only to some extent with our American standard. On some drawings they are indicated either by two solid or broken lines, showing the crest and the root of the thread, followed by a note stating the diameter times the length of the bolt. Others again show complete conventional thread representation, whether square or "v" shape, fine or coarse.

Material Symbols. As far as could be ascertained from the study of the foreign production drawings, the standard American practice seems to be of universal validity.

Sections. An analysis of the foreign drawings reveals identical practice with our American standard: half sections, quarter sections, part sections, removed sections, and revolved sections.

Method of Dimensioning. On the drawings from Germany, Japan, and Norway the dimension figures are placed *between* dimension lines, which is identical with the American standard. On the blueprints from the remaining ten countries they are placed *above* the dimension lines.

In general, it may be said that the method of dimensioning all over the world, as shown by the sample of the foreign drawings, is very similar to our practice.

Lettering. Slant lettering is used on the drawings from the following countries: France, Japan, Australia, South Africa, Germany, Switzerland, Norway, and Italy. Vertical lettering on those from Mexico, Denmark, and Great Britain.

Unit Measure. Ten of the 13 countries use the *metric system;* Great Britain, South Africa, and Australia still use *inches* as we do.

Method of Reproducing Drawings. The sample drawings were reproduced by several methods: Vandyke, Ozalid, and the blueprint, the latter of which seems to be the predominating method, because the largest number of the samples were done in white lines against a blue background.

There are other items which could be subjected to our scrutiny, but those already compared and discussed are sufficient indices of the great similarity between the standard drafting practices of the United States and the rest of the civilized world. Drafting is indeed a world language!

Foreign Drawings as Instruments of Motivation

As instruments of motivation, these foreign production drawings may be utilized in several ways: (1) as a unit exhibit at state fairs, (2) as a unit exhibit in the halls of the school; and (3) as a permanent exhibit in the school drafting room.

The technique of handling these exhibits is somewhat the same for all three types.

For the state fair exhibit we selected a representative sample from each of the thirteen countries. These, with the help of a state fair artist, were arranged in a pleasing, artistic pattern. A number of signs, with telling slogans, were made and attached in the proper places. These slogans read as follows:

"Drafting, the language of industry"

"Drafting, a world language"

"Drafting, the language of, the engineer, the architect, the builder, the mechanic."

Smaller signs were made on which were indicated the respective countries from which the drawings were received: "Made in Japan," or "Made in Mexico," and so on. These signs were attached directly to the drawings.

On either side of these foreign blueprints were placed the drawing plates made in the school drafting room — also properly grouped and artistically arranged.

The main purpose of this state fair exhibit was to show the people in general and the taxpayers in particular, as well as the school administrators that school drafting is neither a frill nor a fad, but that it is a subject of great educational significance and of practical universal application.

It may be said in all modesty that this exhibit attracted some attention. Many a man not only stopped in front of the booth, but came into it, scrutinizing the drawings closely and asking all kinds of questions from the booth attendant. It also elicited many favorable and critical comments from industrial-arts teachers who were in attendance at the state fair.

In the halls of the school, the exhibit may be handled in the same way as the state fair exhibit. Possibly its scope will be limited by the available wall space and proper lighting. It should be pointed out that the effectiveness of the whole undertaking will be vitiated by cramped wall areas and improper illumination.

If properly placed, the blueprints will attract a great deal of attention from the passing students. For many members of the student body such an exhibit will be the only means of conveying the idea that there are other important school subjects besides algebra, French, and so forth.

Unquestionably the most natural as well as most logical place for this kind of exhibit is the school drafting room. Here the teacher is hardly ever hampered by any limiting factors. He can arrange it in the most effective manner possible. Here, surrounded by his students, he can thoroughly discuss these foreign production drawings, and point out their similarities to, and differences from the American drafting standards. For the first time the students are gazing at drawings that have come from far distant lands, yet they feel that they are on familiar ground. They study the technique and draftsmanship illustrated by these foreign blueprints; they compare their work with them and discuss the different lines, conventions, symbols, figures, the method of indicating size and shape and are agreeably surprised to learn that the foreign draftsman's technique is very similar to their own. They are beginning to realize that they are learning a new language which is universal in its application, because they can read and to a very large extent understand the blueprints whether they come from England, France, Mexico, or Japan. Drafting thus assumes a new meaning and assumes a vastly different significance in their eyes. They are ready to see and appreciate the validity of the statements that drafting is indeed a world language as well as the language of industry, of the architect, and of the engineer.

In order to ascertain what effect, if any, the exhibit as well as the numerous discussions produced upon the students, the writer asked his classes to comment freely in writing on the whole project. They were asked not to sign their papers. Some of their reactions follow.

One boy says: "It seems strange that a person whose speech we do not understand, whose written language is a jumble to us can yet put his thoughts on paper in the form of a drawing so that we can correctly interpret his most complicated ideas." Another writes: "It only goes to show that no matter how different the language, the ways of living, or the country itself may be from ours, there is one thing we have in common and that is drafting. It is a language that all countries understand." And finally: "It seems unbelievable to me that someone, on the other side of the world, has put down on paper something which I can understand."

These few quotations indicate clearly that students do react with understanding to something which they believe is of importance to them. It also indicates experiences which could be utilized by the teacher in promoting the student's intellectual growth, and in developing his sense for greater appreciation of values, as well as furthering the cause of drafting, and strengthening his conception of the significance of the work he is doing in the school drafting room.

Conclusions

In conclusion, the thought should be stressed that these samples of foreign drawings do not necessarily indicate the only or prevailing drafting standards of the respective countries from which they came. It cannot be stated with assurance that these and no others are *the* standards and practices of Germany, Norway, France, or Japan. We can only assume that they are representative samples of good commercial practice in the different countries. As such they are instructive, thought provoking, and valuable visual aids. As instruments of motivation they stand unsurpassed.

Co-ordination

Earl M. Bowler

Director, Vocational School,
Rhinelander, Wisconsin

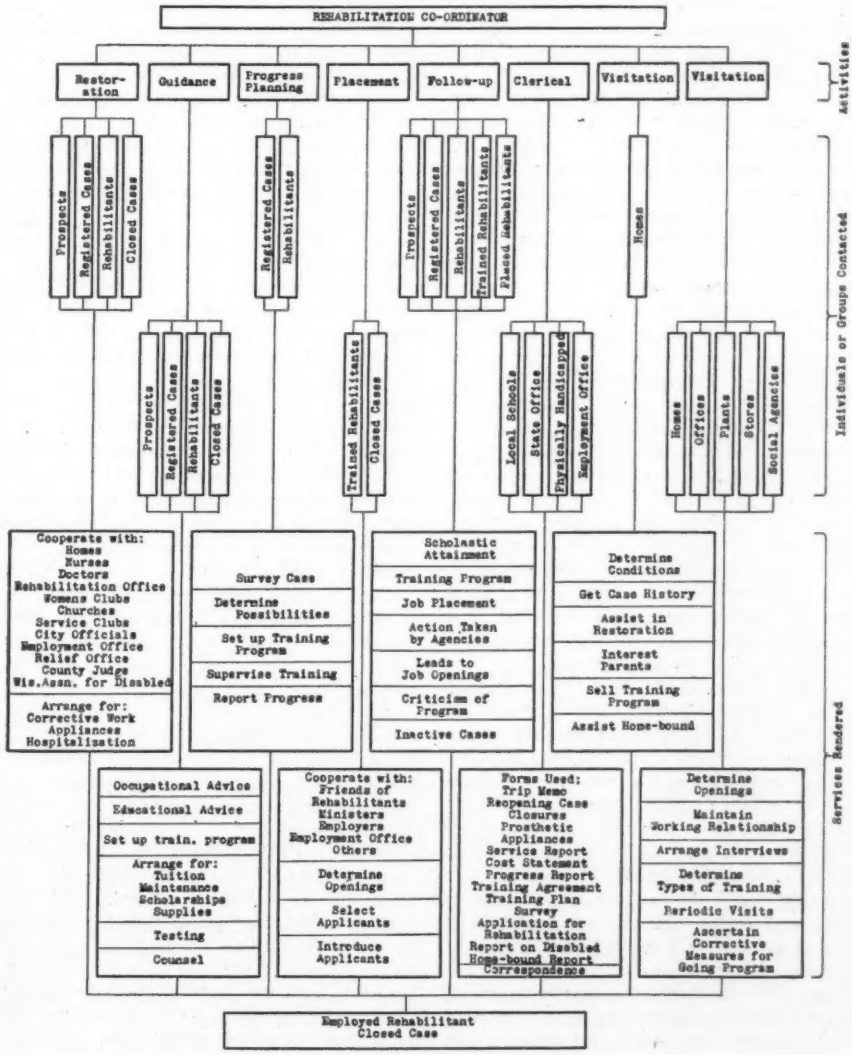
A graphical analysis of the duties of a co-ordinator of rehabilitation.

Considerable interest has been manifested by teachers in the field on the subject of co-ordination. Many teachers, in whose eye the spark of light fails to burn brighter when promotion is brought up as the subject of conversation, suddenly become alive to the fact that here may be the "opening wedge" for them to get into an administrative job. Co-ordination does hold many possibilities for the progressive teacher because of the opportunity afforded to make contacts with leading people in the community.

The co-ordinator who sells his school and its facilities, his director and his program, his students and himself, to the community in which he is working will find that better opportunities for himself are available at home and abroad. A definite plan of attack is important in any selling job. A salesman may not begin in the middle of his territory and work haphazardly in all directions, if he wants to be successful. He cannot guess at his product and at what his customers want, he must know both product and needs. He also must know the relationship his plant and its product have to every other plant, product, agency, and individual in his territory.

The teacher who is planning to enter the field of co-ordination should know the students of his school, moreover he should know the needs of the employers, and of the people of his community. These are but two of the first steps in the game of co-ordination. There are many other steps just as important, all leading to the successful placement of the product of the school plant.

Those interested in co-ordination in vocational education might steal a page from the notes of the rehabilitation co-ordinator. The attached chart pictures a story that might take many pages to tell. Not all of the techniques involved will have carry-over value in a given local situation, but in the main the resourceful individual will see a parallel which will enable him to set forth with some assurance of doing an acceptable job of co-ordination.



THE BOY AT THE BENCH
(By a Shop Instructor)

He measures and saws and planes with a smile;
Quite like he'll "forget" and whistle awhile.
His head's in the clouds and his eager eyes glow,
With a keen satisfaction that you and I know.
Perhaps he's constructing a tray or a frame,
Or a sailboat — what matter? The thrill is the same:
And in spite of the fact that he's rated a flop,
In "Lit." and dramatics — he "stacks up" in shop.

His job may be crude and a trifle askew —
But it's O.K. to him; and the best he can do;
And deep in his heart he is happy and glad,
When he proudly displays it to Mother and Dad.
It may be a "frill" — as some will maintain;
Devoid of the earmarks of cultural gain —
This thing we call shop: but I'm here to attest,
That it spurs him to try, and demands of his best.

Scoff, if you dare, at the work of his hands;
This precious ideal that a boy understands.
He's fashioned much more than his censors discern —
'Tis only by doing that mankind may learn.
He's laying the groundwork for praiseworthy deeds,
That supplement progress and foster its needs;
And I question the ethics of him who would quench
The zeal of the boy who toils at the bench.

— *Adam N. Reiter*

Sources of Strength

Dean M. Schweikhard

Assistant Superintendent of Schools, Minneapolis, Minnesota

Thoughts which are deserving of deepest deliberation by both teacher and student.

The Appeal of Accomplishment

When the civilization of a former day was at its height admiration for physical excellency held a prominent place in the public mind. Strength of muscle and vigor of sinew were recognized not so much by their mere existence as by the accomplishments of the individual possessing them.

Then as now the observer of physical achievements experienced a sudden thrill at the display of strength demonstrated in one form of skill or another. Physical strength makes such a widespread appeal because the things it can accomplish are readily seen. The real attraction for the onlooker is a deep-seated desire that he might be able to accomplish the same feat himself. Not being able to do so he derives secondary satisfaction from seeing it done, but frequently asks the question: "How does he do it?" What he really means to ask is: "Wherein lies the mysterious source of strength which enables this man to do the things I cannot do?"

Further observation leads one to recognize notable accomplishment in fields other than physical performance, such as invention, philosophy, debate, lecture, teaching, trades, homemaking, stenography, and scores of others too numerous to mention. The one who excels always inspires a certain amount of awe in the hearts of those who strive for the same goal. And always there is the same quest for the source of the victor's strength.

The way of wisdom lies not in pursuing strength in fields foreign to one's heritage and never finding the true source; but rather in seeking to discover the sources which lie within oneself or close at hand, and from them drawing strength for appropriate action. Thus one may find through his own successful accomplishments the deepest and soundest satisfactions life can give. Having derived satisfaction through this channel, the accomplishments of others come to have a richer meaning and command a deeper admiration.

Uniting Forces

Many an adage has come from the lips of philosophers and soothsayers carrying the implication of the marked increase in strength due to singleness of purpose or unity of action. These well-spoken truths have become subject to various interpretations. In a tug of war every man pulls on the same rope in the same direction, and the united force of all constitutes the strength of the team; but even there each man must have his own place to stand and his own section of rope to grasp. In that and any number of similar situations the total strength results from the multiplication of units practically identical in nature.

Another sort of interpretation, with more complex, and perhaps more interesting implications, has to do with combining forces of different kinds in order to produce a result not identical with any of them. The effectiveness of modern industry lies in the division of labor; but the mere division would produce stagnation if the various specialized activities were not united toward the accomplishment of a unified result. In a factory this principle, put into practice, has come to be known as the production line.

In schools, churches, lodges, labor organizations, and clubs, people of like interests join themselves together for the purpose of creating added strength for certain established purposes. Sometimes the aims of one group seem to conflict with those of another, but it is well that it should be so for then the strength of each is tested, and increased stability acquired. Practice in debate is encouraged for the consideration of different sides of a question, but the members of each team stick together, with a prearranged division of functions.

It has never been difficult for members of the human family to see that increase of numbers results easily in the increase of strength, sometimes for good purposes, sometimes for bad. Wars are waged by that process, and mobs arise and commit mass crimes. Just as truly great religious movements sweep the world, and nations of free and happy people survive because each contributes to the formation of a unified whole.

The Issue from Within

The comprehension of this principle often fails, however, when applied to the individual. While it is comparatively easy to muster numbers of people to give added strength to a movement, it is much more difficult to recognize the necessity for mustering all of the forces within oneself for the strengthening of himself and the service he can perform. The teacher may come to feel that he has spent his strength, exhausted all his resourcefulness, and knows not where to turn for rejuvenation.

Such a feeling is probably more common at the close of a school year than at any other time. So for teachers, as well as for pupils, comes the vacation period with its varying significance. To some it may loom as a drab and dismal period of time with little to do except wait for the opening of another school year with its regular round of routine duties. Others may look upon it as a time when one may do one or a dozen things just because he wants to. Still others look forward eagerly to engaging vigorously in some other kind of work which will bring exhilaration, change, new experiences, added knowledge, finer skill, and perhaps a much-needed supplement to the family income.

The *kind* of activity in which a teacher engages during the vacation period is a trivial consideration when compared with the benefits which may be derived therefrom. If he attends summer school from a sense of duty, and emerges from the experience pessimistic and fatigued he has in no way added to his strength and effectiveness for the task of teaching ahead of him. Contrarily new professional contacts absorbed with enthusiasm imbue the teacher with the same kind of anticipation for his task as the philosopher who said he rejoiced as a strong man to run a race.

Some phase of contact with nature commonly enters into vacation plans, and such plans carried to fruition usually prove to be beneficial to the participants — but wherein lies the secret of the lure? Perhaps it is in the very quiet but persistent habits of nature herself. The earth, the air, the sunshine, and the rain are the elements available for all vegetation, yet they remain inert unless translated in the heart of the plant or tree into living energy which then may demonstrate itself in flower and fruit.

All about the human being there are the elements vital to healthy growth and renewal of life: the wealth of nature lies ready to be tapped; the human contacts are so myriad as to be confusing and sometimes misleading, but nevertheless vibrant with possibilities; above and around and through all other environmental factors there is a supreme power which is ready to do for the lives of men what the great and powerful sun does for the life of the most gigantic tree or the tiniest plant.

The extent to which these available forces are transformed into usable strength for the service of mankind depends upon the degree with which they are utilized for the recreation of energies and powers constantly being depleted. Therein lies the secret of education of the body, the mind, and the spirit. The pupil who maintains an attitude of receptive eagerness realizes the maximum growth of his own strength for constructive participation in the affairs of life. The teacher who is constantly giving of himself, that strength may be builded into the lives of his pupils, finds his own strength renewed most fully through the regular habit of gleaning the rich benefits to be derived from natural, human, and divine sources. This sort of procedure followed steadfastly and consistently cannot but build into the heart of the nation the same sort of steadfast strength that has grown in the hearts of its people.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Youth and the Future

The need for the right kind of vocational education becomes quite apparent when one reads the various items about employment conditions in newspapers, magazines, and bulletins. From one source comes the information that while Connecticut has 82,000 unemployed, its airplane and munitions shops cannot find enough skilled mechanics even though they are scouring the entire country to find them.

From another source comes a note of warning that young workers who have been lured to take up short courses to prepare them as mechanics for the airplane industry, need not apply in Southern California. The airplane industry there is employing over 25,000 workers. No doubt California also needs skilled workers, but not those whose entire stock in trade consists of the knowledge and skill acquired in a few weeks of attendance at some school which is long on promises but short on fulfillment.

The youth in school should be acquainted with facts of this kind. They should be thoroughly impressed with the need and importance of adequately preparing for what they want to do when they leave school. Trade skills and knowledges cannot be acquired in a short while, no matter how convincing the attractive promises in the advertisements of certain schools may seem.

Many of the young men who have rushed to California thinking that they might get a job in the airplane industry there, have found out, to their sorrow, that the jobs go only to those who are sufficiently prepared. The unsuccessful applicants, in the meantime, are stranded far away from home, amid strangers who resent that relief money should have to be spent on those who attempted to wrest jobs from the native Californians.

The youth in school today may feel that the outlook for the future is very black, but they should also remember that the opportunities for preparing for the future are better than those offered to any previous generation. It is up to youth then to avail itself of all of the educational advantages now open in order to emulate Lincoln's motto, "I will read and study, for some day my chance will come." Even in his day, the future held out only enigmatic promises for which the wise prepared themselves as best they could.

Those young men who are getting themselves ready to enter the industrial field as machinists, patternmakers, designers, and those who studied aeronautics, or learned how to do the work required of the ground crews at airports are now in preferred positions to take advantage of the chances that are or may be offered by the boom in the airplane industry.

Like Lincoln, these modern students worked with the realization that they had to be ready before they could take advantage of an opportunity. While opportunities in the fields of education and training are plentiful, and while openings for employment may still be scarce, nevertheless, now is the time for our students to work assiduously so that they will be ready when their chance comes.

The students in our high schools should not forget that some of our large industries are again seeking suitable material out of which to make future executives. For this purpose they send representatives to the universities to interview those who are about to graduate, with the purpose of interesting them in various schemes of in-service training. In addressing a group of such college students, George R. Beach, Jr., manager of the personnel division of the E. I. du Pont de Nemours and Company, named four requirements which the applicants for positions with his firm should have. These were: high academic standing, a good record for participation in extracurricular activities, a good presentable appearance, and an adaptable temperament.

High-school students who have suitable I.Q. ratings should not be satisfied with high-school graduation, if employment is not immediately obtainable. They ought to make every effort to enter institutions of higher learning, thereby, making better use of time which might otherwise be spent in idleness, and thus prepare themselves still better for the time when their "chance will come."

The Dangers of the Vacation Months

Again the schools are ready to close their doors for the summer months, turning their charges over to the care of the home, or more probably, merely turning them out on the community. The youngsters, who have been under surveillance for the better part of each day, are now placed in a position where they are without supervision for practically the entire day.

It is time, then, to begin preparing them for vacation freedom, by calling their attention to some of the dangers which will confront them. There is, first of all, the danger of associating with wrong companions. Probably not much can be done by merely talking about these dangers, but if that is the only thing possible under the circumstances, if the community and other social agencies, for instance, are doing nothing to safeguard the children, then the teacher can at least try this method.

With some children, the teacher can achieve much just by admonishing them in an impressive and forceful manner. The writer, for instance, knew a principal of a large school who spoke so impressively at assembly on several occasions when thefts were reported, and he made such an appeal to the guilty party to redeem himself by returning what had been stolen, that the things actually were brought back. This method then can be made efficient. Trying it is better than doing nothing.

Then there is the matter of the youngsters' safety during this period of unsupervised activities. Again the appeal can only be made by word of mouth, but their attention may be called to such statistics as have been gathered on the subject of safety. For instance, the total fatal automobile accidents during 1939 numbered 32,100. Of this large number, 12,470 of those killed were pedestrians, and 780 bicycle riders. While the fatality figures are frightfully high, they are really dwarfed by the totals representing persons receiving injuries. This figure reaches the astonishing sum of 1,210,200 of which 293,810 were pedestrians, and 38,830 bicyclists.

Of course, there are many other opportunities for fatal or nonfatal accidents, but those on the streets and highways need to be specially emphasized.

That some type of instruction for preparing students for the summer months is timely, goes without saying. As shop teachers — can we do something about it?

Testing and Tests

STANDARDIZED INDUSTRIAL-ARTS TEST
Robert P. Jensen,
Instructor of Industrial Arts,
State Teachers College,
Emporia, Kansas

This test was prepared for and used by the Bureau of Educational Measurements of the Kansas State Teachers College.

General Directions: Read the directions for each part and follow them. Answer easy items first; return to others later. You will have exactly 40 minutes.

Possible Score .... 122. Number wrong and omitted .... Final Score ....
Name..... School.....
Age..... Grade..... State.....
Date.....

Part I

Directions: Read the following sentences carefully. If a statement is true, place a plus (+) in the parenthesis before the statement, as in Example A below. If the statement is false, make a minus (—) in the parenthesis, as in Example B.

Examples: (+) A. America was discovered by Columbus.
(—) B. The first president of the United States was Abraham Lincoln.

( ) 1. A screw driver is sharpened to a chisel point.
( ) 2. Coping saws are used to cut curves in thin wood.
( ) 3. Varnish is applied over a waxed surface.
( ) 4. The teeth of a crosscut saw are filed square across.
( ) 5. Quarter-sawed lumber is ordinarily more expensive than plain-sawed lumber.
( ) 6. No. 1 sandpaper is coarser than No. 00 sandpaper.
( ) 7. Oak is an open-grained wood.
( ) 8. A jack plane is larger than a block plane.
( ) 9. Wood filler is left approximately 24 hours before being wiped off.
( ) 10. Surfaces which are to be joined with glue should be sanded.
( ) 11. The blade of a spokeshave should be put in with the bevel side down.
( ) 12. Wood filler is thinned with alcohol.
( ) 13. Oil stains are easier to apply than water stains.
( ) 14. Tenpenny nails are larger than eightpenny nails.
( ) 15. Square-edged boxwood rules should be placed on edge for accurate measuring.
( ) 16. An auger bit should be sharpened on the outside of the nibs.
( ) 17. Linseed oil is used on oilstones.
( ) 18. Ordinary animal glue is waterproof.
( ) 19. A quartersawed board warps more than a plain-sawed board.
( ) 20. Varnish remover will soften dry paint.
( ) 21. Picture frames are usually made with butt joints.
( ) 22. Lag screws have square heads.
( ) 23. Filler is ordinarily wiped off in the direction of the grain.
( ) 24. A gloss paint flows out more evenly than a flat paint.
( ) 25. Coping, miter, and compass saws are used for sawing curves.
( ) 26. The size of a screw is designated by two numbers, for example, 1¼ in. No. 8.
( ) 27. A level is used to test horizontal surfaces in house construction.
( ) 28. Varnish is thinned with turpentine.
( ) 29. Birch and beech are two good substitutes for mahogany.
( ) 30. Dowels make the best types of joints for cabinet construction work.
( ) 31. First-aid equipment should be in every shop.
( ) 32. The skew is used to turn off corners of square stock.
( ) 33. Gumwood cannot be used to imitate walnut.
( ) 34. Spindle, chuck, and faceplate are types of lathe work.
( ) 35. Lacquer is thinned with alcohol.
( ) 36. A gimlet is a type of plane.
( ) 37. Varnishing should be done in a cool room.
( ) 38. Basswood is a close-grained wood.
( ) 39. The size of the chisel is indicated by the width of the cutting edge.
( ) 40. There are two adjustments for the blade of the modern plane.
( ) 41. A hand drill is used when boring holes with round-shank twist drills.
( ) 42. Horizontal lines are drawn along the upper edge of the T square.
( ) 43. Circular lines are made with a compass.
( ) 44. Straight lines should be inked before the inking of curves and arcs.
( ) 45. Object lines are more heavily inked than border lines.
( ) 46. A 6B grade of drawing pencil is very hard.
( ) 47. Isometric drawings are always constructed on a 45-degree angle.
( ) 48. Hidden lines are solid but smaller than visible lines.
( ) 49. An angle of 90 degrees is a right angle.
( ) 50. Dividers may be used in laying out small measurements.
( ) 51. Most drawing boards are made of oak.
( ) 52. The top view is usually placed above the end view.
( ) 53. The scale should never be used as a straightedge when drawing lines.
( ) 54. Each line should be made with a single stroke.
( ) 55. Some materials conduct electricity better than others.
( ) 56. The ampere is the unit of electrical pressure.
( ) 57. Connecting batteries in series increases the voltage.
( ) 58. Copper is a nonconductor of electricity.
( ) 59. Electricity will produce heat.
( ) 60. Flashlight batteries are connected in parallel.
( ) 61. A transformer will work on direct current.
( ) 62. Glass is a good insulator.
( ) 63. The electric motor makes use of the electromagnet to produce motion.
( ) 64. All soldering coppers must be heated to a cherry red for a satisfactory job.
( ) 65. Soldering is the process of joining two pieces of metal by means of a third metal of lower melting point.
( ) 66. You must use rosin on galvanized iron for a soldering flux.
( ) 67. The hack saw is an important tool used in cutting strap iron.
( ) 68. Copper and brass are softened by heating to a red heat and quenching in cold water.
( ) 69. Cut acid or soldering flux is made by adding tin scraps to hydrochloric acid.
( ) 70. Cold chisels should be ground to a long tapering bevel.
( ) 71. A 24-gauge metal is heavier than 20-gauge metal.
( ) 72. A No. 9 wire is heavier than a No. 12 wire.
( ) 73. Size of sheet-metal rivets is determined by the weight per 1,000.
( ) 74. Brass is made of copper and lead.
( ) 75. A burnisher is used in sharpening a plane iron.

Part II

Directions: Place the number of the part which makes the best answer to the statement in the parenthesis before the sentence, as in the following example.

Example: (3) The capital of the United States is:
(1) Boston, (2) Chicago, (3) Washington, (4) New York.

In this example "Washington" is the correct answer; therefore, a figure 3 has been placed in the parenthesis.

( ) 76. Which is hardest of our common woods? (1) maple, (2) walnut, (3) mahogany, (4) pine, (5) cedar.
( ) 77. What tool is used to make holes in metal? (1) auger bit, (2) twist drill, (3) extension bit, (4) gimlet drill.
( ) 78. What acid is used in etching copper? (1) hydrochloric, (2) sulphuric, (3) muriatic, (4) nitric.
( ) 79. What is the voltage of a common car storage battery? (1) 2. (2) 4. (3) 6. (4) 12.
( ) 80. Which of the following metals costs the most per pound? (1) German silver, (2) pewter, (3) brass, (4) iron.
( ) 81. Which of the following woods is the most expensive? (1) pine, (2) walnut, (3) mahogany, (4) cherry.
( ) 82. With what should varnish brushes be cleaned? (1) kerosene, (2)

turpentine, (3) water, (4) alcohol.

( ) 83. What tool in wood turning is used for the first roughing cut? (1) skew, (2) gouge, (3) diamond point, (4) round nose.

( ) 84. If one angle of a drawing triangle is 30°, and one is 90°, what is the other angle? (1) 30°. (2) 90°. (3) 60°. (4) 180°.

( ) 85. What measuring tool is used in drawing objects when not showing them full size? (1) carpenter's rule, (2) circumference rule, (3) architect's scale, (4) try square.

( ) 86. What cutting angle is used on wood cutting tools? (1) 10°. (2) 60°. (3) 30°. (4) 90°.

( ) 87. What cutting angle is used on a cold chisel? (1) 10°. (2) 60°. (3) 30°. (4) 90°.

( ) 88. What plane should be used in preparing edges for gluing? (1) block, (2) jack, (3) jointer, (4) rabbet.

( ) 89. The most iron ore is found in which of the following states? (1) Minnesota, (2) Pennsylvania, (3) Ohio, (4) Illinois.

( ) 90. What saw is used to saw iron? (1) coping saw, (2) back saw, (3) hack saw, (4) jig saw.

( ) 91. How many board feet are there in a board that is 1 by 6 in. by 10 ft.? (1) 6, (2) 5, (3) 10, (4) 12.

( ) 92. How many square feet of metal in a piece that is 24 by 48 in.? (1) 2, (2) 4, (3) 6, (4) 8, (5) 10.

( ) 93. Lumber that costs $50 M. is how much per board foot? (1) 10c, (2) 5c, (3) 50c, (4) 12c, (5) ½c.

( ) 94. What wood is most commonly used in cheap furniture to imitate walnut? (1) pine, (2) gumwood, (3) maple, (4) oak, (5) redwood.

( ) 95. Architectural drawings are used to show what kinds of objects? (1) machine parts, (2) houses, (3) furniture, (4) roads.

Part III

Directions: From the list of answers in Column II select the word which matches each item of Column I, and write the number of the answer in the parenthesis at the left of the item. The items of one section may be matched only with the answers in Column II of the same section. The example has been correctly marked.

Example: (10) A fuel used in automobiles.

Column I	*Column II*
( ) 96. The tool used to drive a wood chisel.	1. alcohol
( ) 97. The wood most commonly used for hammer handles.	2. birch
( ) 98. The material from which linseed oil comes.	3. board foot 4. burnisher
( ) 99. The unit of board measure.	5. claw hammer
( ) 100. A rectangular groove across the grain of a board.	6. cottonseed
( ) 101. The tool used to turn the edge of a cabinet scraper.	7. crosscut saw
( ) 102. The saw used to cut wood lengthwise with the grain.	8. dado 9. flaxseed
( ) 103. The thinner used for varnish.	10. gasoline
( ) 104. The thinner used for shellac.	11. hickory
( ) 105. The thinner used for outside paint.	12. kerosene
( ) 106. The part of the joint into which the tenon fits.	13. linseed oil 14. mallet
( ) 107. The tool used to set nails below the surface of the wood.	15. maple 16. milk
( ) 108. The material from which casein glue is made.	17. mortise 18. nail set
( ) 109. Layers of thin wood glued together.	19. plywood
( ) 110. Layers of cells showing up as circular rings on end of log.	20. rabbet 21. ripsaw 22. turpentine
( ) 111. The material used for the container of a dry cell battery.	1. aluminum
( ) 112. The unit by which electric bills are computed.	2. ampere
( ) 113. The unit of electrical pressure.	3. annealing
( ) 114. The measure of electrical power.	4. brass
( ) 115. The measure of flow of electricity.	5. copper
( ) 116. The protective device in a circuit which prevents fire in case of a short.	6. degree 7. fuse 8. horsepower
( ) 117. The unit used to measure sizes of angles.	9. kw. hr. 10. perspective
( ) 118. The type of drawing in which the lines all converge toward a common point on the horizon.	11. polygon 12. rectangle 13. smelting
( ) 119. The name designating a many-sided figure.	14. tin
( ) 120. The metal used with lead in making solder.	15. volt
( ) 121. The metal used with tin in making bronze.	16. watt
( ) 122. The process of changing iron oxide to metallic iron.	17. zinc

Key

Paper must be scored according to this key. Give one point for each correct answer. An omission is counted as an error. Possible score 122.

Part I

1. —	20. +	39. +	58. —
2. +	21. —	40. +	59. +
3. —	22. +	41. +	60. —
4. —	23. —	42. +	61. —
5. +	24. +	43. +	62. +
6. +	25. —	44. —	63. +
7. +	26. +	45. —	64. —
8. +	27. +	46. —	65. +
9. —	28. +	47. —	66. —
10. —	29. +	48. —	67. +
11. +	30. —	49. +	68. +
12. —	31. +	50. +	69. —
13. +	32. —	51. —	70. —
14. +	33. —	52. —	71. —
15. +	34. +	53. +	72. +
16. —	35. —	54. +	73. +
17. —	36. —	55. +	74. —
18. —	37. —	56. —	75. —
19. —	38. +	57. +	

Part II

76. (1)	81. (3)	86. (3)	91. (2)
77. (2)	82. (2)	87. (2)	92. (4)
78. (4)	83. (2)	88. (3)	93. (2)
79. (3)	84. (3)	89. (1)	94. (2)
80. (2)	85. (3)	90. (3)	95. (2)

Part III

96. (14)	100. (8)	104. (1)	108. (16)
97. (11)	101. (4)	105. (13)	109. (19)
98. (9)	102. (21)	106. (17)	110. (23)
99. (3)	103. (22)	107. (18)	
111. (17)	114. (16)	117. (6)	120. (14)
112. (9)	115. (2)	118. (10)	121. (5)
113. (15)	116. (7)	119. (11)	122. (13)

PERCENTILE EQUIVALENTS OF INDUSTRIAL-ARTS TEST SCORES

Possible score 122 — Highest score 113 — Lowest score 47 — No. of cases 1696 — Total tests distributed 3728

Score	Percentile Equivalent	Score	Percentile Equivalent
107	99	82	45
99	95	80	40
96	90	79	35
93	85	77	30
91	80	76	25
90	75	74	20
88	70	72	15
87	65	69	10
86	60	65	5
84	55	56	1
83	50		

FINAL EXAMINATION FOR INDUSTRIAL-ARTS WOODWORKING CLASSES

James F. Ahlbach,
State School for Boys,
Jamesburg, New Jersey

This is a final examination in woodworking for students of industrial arts. It consists of seven different types of related test questions; namely, true and false, sentence-completion, multiple-choice, Yes-No, matching (name of tools), misspelled technical words, and hardware (name of pieces) questions. It should be given primarily at the end of the second semester, after the teacher has given a number of other tests throughout the school year. In so doing, the teacher will ascertain definitely, how much each individual student has learned after a year's work in the industrial-arts woodworking course.

In grading, the highest possible score any one pupil can obtain is 100. For each correct response, one point of credit is given. Two points of credit are deducted for each incorrect response of all *true and false*, and *yes-no* questions. No credit is given or deducted for questions unanswered. Each test is accompanied by a scoring key.

The Examination

Part	*Score*
1. True and False Questions	
2. Sentence — Completion	
3. Multiple-Choice Questions	
4. Yes — No Questions	
5. Matching (Name of Tools) Questions	
6. Misspelled Technical Words	
7. Hardware (Name of Pieces) Questions	
Total Score	

Student's Name .....
Grade ..... Age.....
Name of School.....
Date.....

Part 1. True and False Questions

Directions: The letter T and F precede each statement below. Encircle the letter (T) if you think the statement is true. Encircle the letter (F) if you think the statement is false. *Do not guess.* If you are unable to decide whether a statement is true or false, leave question unanswered. You will be penalized for each statement incorrectly marked by a deduction of *two* points of credit from the number of correctly marked statements. Notice the sample statement.

Sample. (T) F. Joints should never be sanded when glue is to be applied.

1. T F Poplar is a harder wood to work than oak.
2. T F The setting of a marking gauge should be checked with a rule before the gauge is used.
3. T F While working at the band saw, circular saw, jointer, or lathe, it is best for pupils to work in groups.
4. T F When starting to square up a board it is best to select the best surface as the working face.
5. T F Kiln drying is a faster method of drying lumber than air drying.
6. T F When testing an edge for squareness, always hold the handle of the square against the working face.
7. T F Knots and shakes do not affect the quality of lumber for cabinet-making purposes.
8. T F A tool for cutting various sizes of round holes from ¼ to 1 in. in diameter is called an auger bit.
9. T F A hole should be bored through a piece of wood from one side only.
10. T F The proper method of ordering lumber is thickness x width x length.
11. T F When tools are being whetted, it is important to use heavy oil on the stone.
12. T F It is not necessary to make allowances for waste when ordering wood for the sides of an end table.
13. T F When sawing on the band saw, the worker should stand directly in front of the saw.
14. T F It is not desirable to square up stock to the correct size before duplicate parts are laid out.
15. T F When using a chisel to smooth curves one must be very careful always to chisel with the grain.
16. T F Hot glue is of the proper consistency when it will run or drip from the brush in a thin stream and flow easily when applied.
17. T F The coping saw and the backsaw have the same kind of teeth.
18. T F In order to secure greater strength when using nails to fasten two boards together, the nails should be driven in straight.
19. T F A blind mortise joint is stronger than a plain butt joint.
20. T F The tenon of a mortise-and-tenon joint should always be longer than the depth of the mortise.
21. T F After wood paste filler has become dull, the excess filler should be rubbed off across the grain.
22. T F Gumwood cannot be finished in mahogany.
23. T F The turning saw is better adapted to very thin wood than the coping saw.
24. T F Walnut wood takes a beautiful, dark, natural finish.
25. T F All wire brads have flat heads.

Right ..... Omitted .....
Wrong ..... Score .....

Scoring Key

1. F	2. T	3. F	4. T	5. T
6. T	7. F	8. T	9. F	10. T
11. F	12. F	13. T	14. T	15. F
16. T	17. F	18. F	19. T	20. F
21. T	22. F	23. F	24. T	25. F

Part 2. Sentence-Completion Questions

Directions: The following statements are incomplete, one word having been omitted. You are to fill the blank space with the proper word that will make the sentence a true statement. *Notice the sample statement.*

Sample. Miter ..... joints should be cut in a miter box.

1. Black ..... is commonly used in cabinet construction.
2. Oil and paint ..... should never be left in a heap because of the danger of spontaneous combustion.
3. A piece of wood one inch thick must have ..... square inches of face-surface area in order to contain one board foot.
4. The first side of a board planed is called the ..... face.
5. A two-handled tool used for curved surfaces and working on the same principle as a plane is called a .....
6. Dimensions of lumber are usually given in the following order ..... x ..... x .....
7. A gauge line for the width of a board should be gauged from the ..... edge.
8. A ripsaw and a ..... saw resemble each other in appearance in all except the teeth.
9. A tool used for cutting various sizes of round holes from ⅞ to 3 in. in diameter is called an ..... bit.
10. Round pieces of wood used to assist in joining boards which are glued edge to edge are .....

Score ..... Right .....

Scoring Key

1. walnut	6. thickness x width x length
2. rags	7. working
3. twelve	8. crosscut
4. working	9. expansive
5. spokeshave	10. dowels

Part 3. Multiple-Choice Questions

Directions: In each of the following sentences underline the word in parenthesis that makes the best meaning. Then place the number of the underlined word in the brackets at the left of each question.

Sample. (3) An auger bit for boring a ¾-in. hole is number (1–four) (2–eight) (3–twelve) (4–sixteen).

1. ( ) The lumber bill for an end table can easily be put into (1–one) (2–two) (3–three) pieces.
2. ( ) A good blind mortise-and-tenon joint consists of (1–one) (2–two) (3–three) major fits.
3. ( ) The length of the tenon must be (1–the same as) (2–larger than) (3–shorter than) the depth of the mortise.
4. ( ) When driving nails into end wood it is best to (1–drive straight) (2–use soap) (3–slant the nail).
5. ( ) Nails are usually driven with a (1–sledge) (2–claw hammer) (3–sledge).
6. ( ) The shank hole is bored to fit the (1–head) (2–roundhead) (3–threaded part) (4–smooth part) of a wood screw.
7. ( ) When the head of a screw is to be left level with or a little below the surface, use a (1–ovalhead) (2–flathead) (3–roundhead) screw.
8. ( ) Lumber is sold by the (1–weight) (2–cubic foot) (3–board foot).
9. ( ) The tool used to make the hole for the head of a flat-headed wood screw is called a (1–gimlet) (2–reamer) (3–punch) (4–countersink).
10. ( ) The abbreviations "S2S" in woodworking means (1–square two sides) (2–sand two sides) (3–surface two sides).

Score ..... Right .....

Scoring Key

1. (1) 1–one	6. (4) 4–smooth part
2. (1) 1–one	7. (2) 2–flathead
3. (3) 3–shorter than	8. (3) 3–board foot
4. (3) 3–slant the nail	9. (4) 4–countersink
5. (2) 2–claw hammer	10. (3) 3–surface two sides

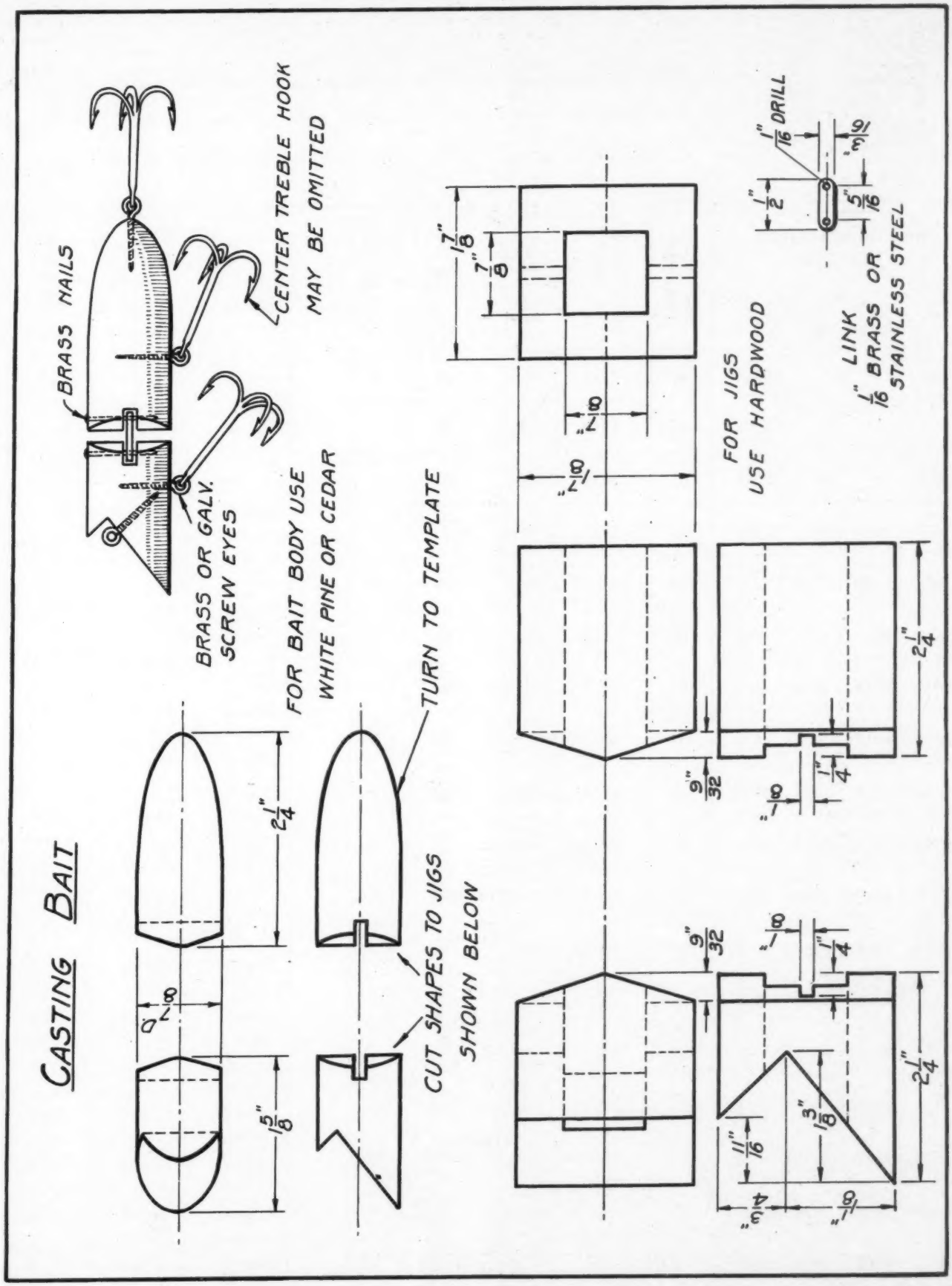
Part 4. Yes — No Questions

Directions: A number of questions follow, some of which should be answered by Yes, others by No. Underline the word *Yes* if you think it should be answered Yes. Underline the word *No* if you think it should be answered No. *Do not guess.* If you are unable to decide whether a question should be marked *Yes* or *No*, leave it unanswered. You will be penalized for each question incorrectly marked by a deduction of *two* points of credit from the number of correctly marked questions. Notice the sample question.

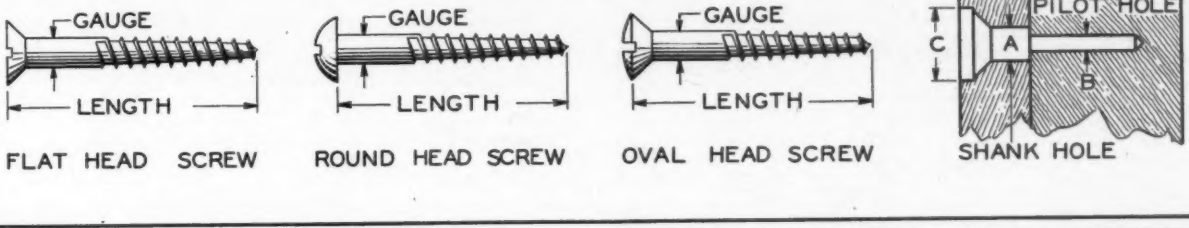
Sample. Yes *No.* Is the rich color of cedar obtained by staining it?

1. Yes No Is maple used for bench tops because of its hardness?
2. Yes No Is poplar wood sometimes stained to imitate mahogany?
3. Yes No When a try square is available, is it best to use it instead of a rule for accurate measuring?
4. Yes No Should the spur of the marking gauge be used for marking chamfers and bevels?
5. Yes No Is is necessary to keep the edge of the rule parallel to the edge of the stock for accurate measuring?
6. Yes No Is the lateral adjustment of the

(Continued on page 241)



For descriptive article, see page 243. *Submitted by W. A. DeVette, Technical High School, Erie, Pennsylvania*



LENGTH	GAUGE	
	STEEL SCREWS	BRASS SCREWS
1/4	0 to 4	0 to 4
3/8	0 to 8	0 to 6
1/2	1 to 10	1 to 8
5/8	2 to 12	2 to 10
3/4	2 to 14	2 to 12
7/8	3 to 14	4 to 12
1	3 to 16	4 to 14
1-1/4	4 to 18	6 to 14
1-1/2	4 to 20	6 to 14
1-3/4	6 to 20	8 to 14
2	6 to 20	8 to 18
2-1/4	6 to 20	10 to 18
2-1/2	6 to 20	10 to 18
2-3/4	8 to 20	8 to 20
3	8 to 24	12 to 18
3-1/2	10 to 24	12 to 18
4	12 to 24	12 to 24
4-1/2	14 to 24	14 to 24
5	14 to 24	14 to 24

GAUGE NO.	ACTUAL SIZE	DECIMAL	APPROX. FRACTIONS	THREADS PER INCH	DRILL OR AUGER BIT SIZE			
					A	B		C
						HARD WOOD	SOFT WOOD	
0		.060	1/16	32	1/16			
1		.073	5/64	28	3/32			
2		.086	5/64	26	3/32	1/16		3/16
3		.099	3/32	24	1/8	5/64	1/16	4/16
4		.112	7/64	22	1/8	3/32	5/64	4/16
5		.125	1/8	20	1/8	3/32	5/64	4/16
6		.138	9/64	18	5/32	7/64	3/32	5/16
7		.151	5/32	16	5/32	1/8	7/64	5/16
8		.164	5/32	15	3/16	9/64	1/8	6/16
9		.177	11/64	14	3/16	5/32	1/8	6/16
10		.190	3/16	13	3/16	11/64	9/64	6/16
11		.203	13/64	12	7/32	11/64	9/64	7/16
12		.216	7/32	11	7/32	3/16	5/32	7/16
14		.242	15/64	10	1/4	13/64	11/64	8/16
16		.268	17/64	9	9/32	15/64	13/64	9/16
18		.294	19/64	8	5/16	17/64	15/64	10/16
20		.320	21/64	8	11/32	9/32	1/4	11/16
24		.372	3/8	7	3/8	21/64	19/64	12/16

Information about wood screws

(Continued from page 236)

plane iron controlled by the thumbscrew adjustment?

7. Yes No Is the bed of a jack plane approximately 22 in. long?
8. Yes No Should you look toward the light when sighting for levelness of plane iron?
9. Yes No Should the plane be run at an angle when jointing the edge of a board?
10. Yes No Should the sharp corners of a plane iron be removed on the grinding wheel?
11. Yes No Should the spur of the marking gauge be kept in a vertical position when marking lines on stock?
12. Yes No Is the coping saw used so that it cuts on the pull stroke?
13. Yes No Should a center line be placed on the stock before transferring the design from the pattern?
14. Yes No Is the shank hole for flathead screws countersunk?
15. Yes No Is it good practice to use the mallet to force the chisel when paring end grain?

Right ..... Omitted .....
Wrong ..... Score .....

Scoring Key

1. Yes	2. Yes	3. No	4. No	5. Yes
6. No	7. No	8. Yes	9. No	10. Yes
11. No	12. No	13. Yes	14. Yes	15. No

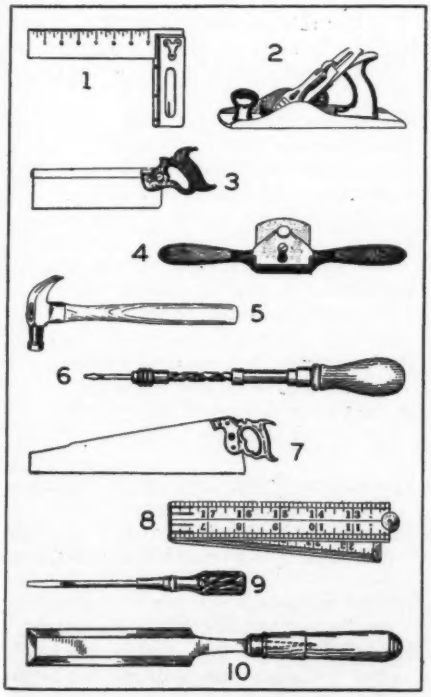
Part 5. Matching (Name of Tools) Questions

Directions: Give the proper names of each tool shown in the illustration. Be as definite as you possibly can. If there is a picture of a saw, plane, etc., tell what kind of a saw, plane, etc., it is. You will receive one point of credit for each correct answer.

1. ..... 4. .....
2. ..... 5. .....
3. ..... 6. .....
7. ..... 9. .....
8. ..... 10. .....
Score ..... Right .....

Scoring Key

1. try square
2. jack plane
3. backsaw
4. spokeshave
5. claw hammer
6. spiral screw driver
7. hand saw
8. folding rule
9. screw driver
10. paring chisel

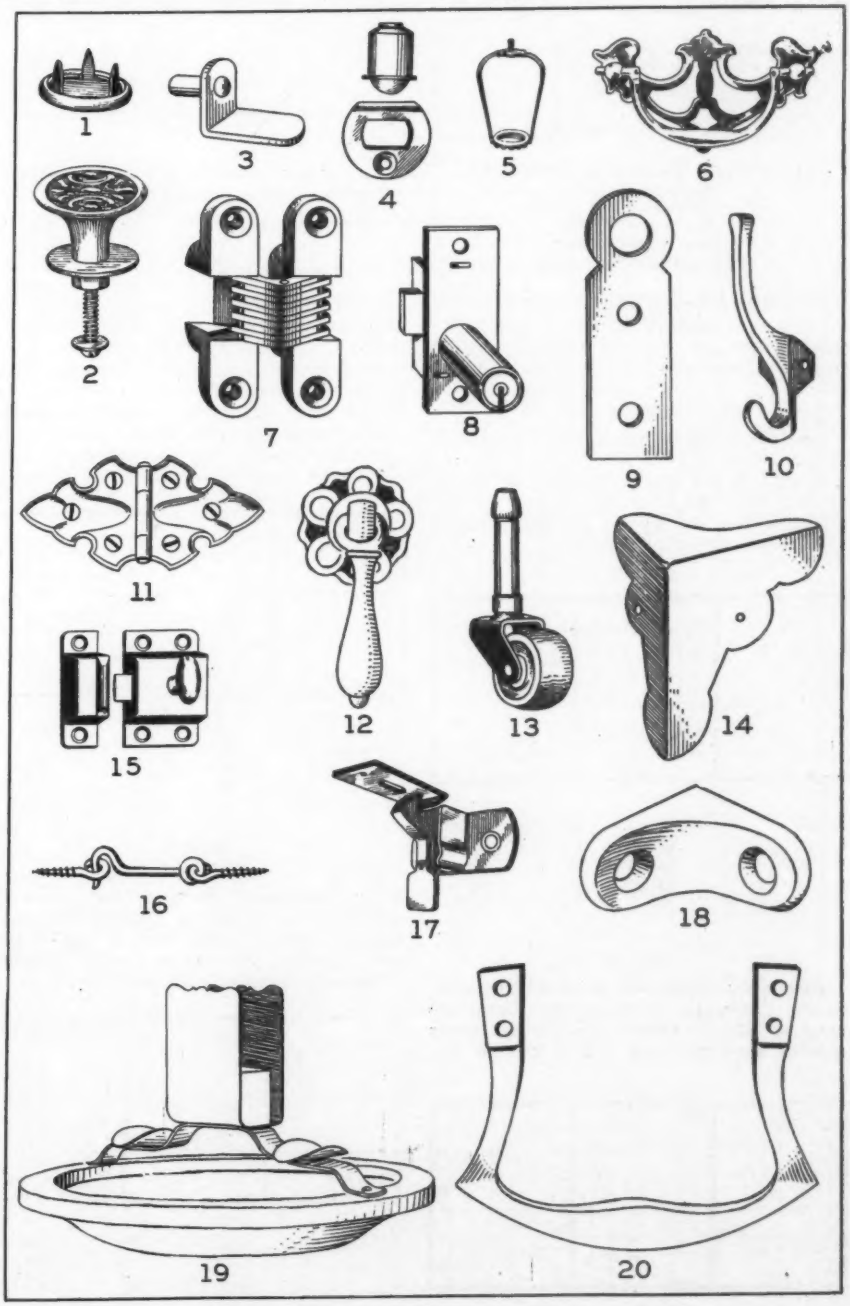


Part 5. Name of tools

Part 6. Misspelled Technical Words

Directions: Following are fifty technical words (tools and materials) that are used in woodworking, of which, ten are misspelled. For each misspelled word, write the correct word in the space provided for it. Leave blank spaces where you think words are spelled correctly. *Do not guess.* You will receive one point of credit for each misspelled word that is corrected.

1. screw driver .....
2. brace .....
3. guage .....
4. rule .....
5. try square .....
6. bevel .....
7. crosscut saw .....
8. jack plane .....
9. vice .....
10. claw hammer .....
11. varnish .....
12. nail set .....
13. expansive bit .....
14. plastic wood .....
15. shellack .....
16. wood dye .....
17. dividers .....
18. spokeshave .....
19. auger bit .....
20. sandpaper .....



Part 7. Hardware — For test see next page

21. steal wood .....
22. band saw .....
23. hand screws .....
24. toothing bit .....
25. coping saw .....
26. Fostner bit .....
27. oilstone .....
28. workbench .....
29. colipers .....
30. hand drill .....
31. chisle .....
32. brads .....
33. block plain .....
34. project .....
35. paint .....
36. slipstone .....
37. blueprint .....
38. wood rasp .....
39. glue .....
40. malet .....
41. screw-driver bit .....
42. lathe .....
43. wood screws .....
44. dowling jig .....
45. bar clamp .....
46. bench hook .....
47. rottenstone .....
48. wood filer .....
49. hinge .....
50. turning gouge .....

Score ..... Right .....

Scoring Key

3. gauge
9. vise
15. shellac
21. steel wool
26. Forstner bit
31. chisel
33. block plane
40. mallet
44. doweling jig
48. wood filler

Part 7. Hardware (Name of Pieces) Questions

(See illustration on page 241)

Directions: Name the various pieces of hardware that are shown and numbered in the illustration. *Be very accurate.* You will receive one point of credit for each correct answer.

1. ..... 2. .....
3. ..... 12. .....
4. ..... 13. .....
5. ..... 14. .....
6. ..... 15. .....
7. ..... 16. .....
8. ..... 17. .....
9. ..... 18. .....
10. ..... 19. .....
11. ..... 20. .....

Score ..... Right .....

Scoring Key

1. sliding caster
2. drawer knob
3. shelf rest
4. friction catch
5. socket harp
6. drawer pull
7. invisible hinge
8. cabinet lock
9. mirror hanger
10. costumer hook
11. flap hinge
12. drop-handle drawer pull
13. tea-wagon caster
14. chest corner
13. cupboard turn
16. screw hook and eye
17. elbow catch
18. metal corner brace
19. tray
20. serving-tray handle

TESTS ON THE CALIFORNIA TYPE CASE

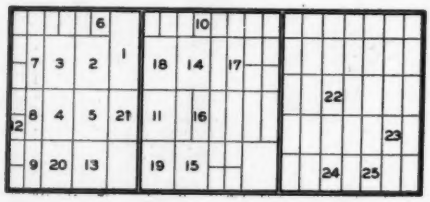
E. V. Ahonen,
Junior High School,
Chisholm, Minnesota

Unit Tests for Printing — 1. Elementary Composition

Name ..... Class .....
Date ..... Grade .....

Part 1

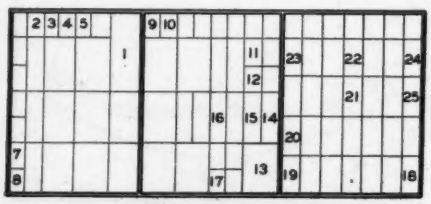
Directions: Below will be found an outline of the California job case. Some boxes are numbered. In the blanks, opposite the proper number write the letter that is kept in that particular box. By way of example, Number 1 has been correctly answered.



1..e.. 6.... 11.... 16.... 21....
2.... 7.... 12.... 17.... 22....
3.... 8.... 13.... 18.... 23....
4.... 9.... 14.... 19.... 24....
5.... 10.... 15.... 20.... 25....

Part 2

Directions: Below will be found an outline of the California job case. Some boxes are numbered. In the blanks, opposite the proper number write the letter that is kept in that particular box. By way of example, Number 1 has been correctly answered.



1..e.. 6.... 11.... 16.... 21....
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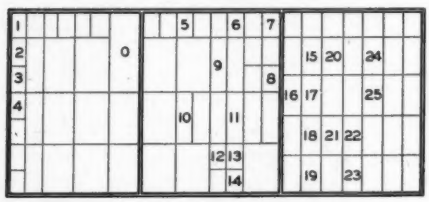
3.... 8.... 13.... 18.... 23....
4.... 9.... 14.... 19.... 24....
5.... 10.... 15.... 20.... 25....

Part 3

Directions: Below will be found an outline of the California job case. Some boxes are numbered. In the blanks, opposite the proper number write the letter that is kept in that particular box. By way of example, Number 0 has been correctly answered, thus: 0—*e*.



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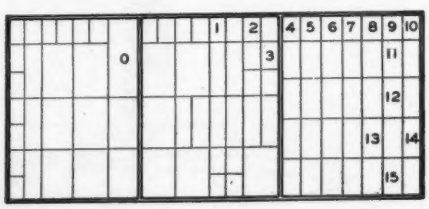
2.... 7.... 12.... 17.... 22....
3.... 8.... 13.... 18.... 23....
4.... 9.... 14.... 19.... 24....
5.... 10.... 15.... 20.... 25....

Part 4

Directions: Below will be found an outline of the California job case. Some boxes are numbered. In the blanks, opposite the proper number write the letter that is kept in that particular box. By way of example, Number 0 has been correctly answered, thus: 0—*e*.



1.... 4.... 7.... 10.... 13....
2.... 5.... 8.... 11.... 14....
3.... 6.... 9.... 12.... 15....

THE BUILDERS

A. C. Phillips, Teacher of Woodwork,
San Luis Obispo Public Schools,
San Luis Obispo, California

Dedicated to the Industrial-Arts Teachers of America

In dreams are more wonderful castles
Than ever were seen by the eye,
Their battlements gleaming with jewels,
Their spires in a roseate sky.

We wake — the ecstatic illusion
Still warming the heart with its glow —
And we view the dull heavens and wonder
How dreams such enchantment could know.

Would you build for yourself such a castle
As this that a dream world has shown,
If I gave you the plans and a picture
And showed you the tools and the stone?

Would you furnish the labor and mortar
To fit every stone to the wall
Content that for remuneration
Just being the Builder was all?

You will need to be careful, O Builder,
Nor let the rough-hewn stones annoy;
For fairness and love is the mortar,
And each separate stone is a boy!

He is eager to help in your building,
He wants to be guided and learn,
If the master is earnest and patient
And gifted with eyes to discern.

You can teach him the love of creating,
The beauty of structure and line;
Till he gives his whole heart to that castle,
More fair than e'er looked on the Rhine!

He will make each new day more abundant,
As the soul of him grows and expands;
He will know his own shop as his castle,
And his glory the tools in his hands!

Problems and Projects

CASTING BAIT

W. A. DeVette,
Technical High School,
Erie, Pennsylvania

(For illustration see page 237).

It is fun to catch fish with any kind of casting plug, but how much more so with one of your own making. Here is one that can be made for about nine cents. And does it catch bass! Well, this is no fish story, but the Junior Sportsmen's Club at Technical High made about two dozen last winter and a lot more this winter. All colors were used, from red and white, through various combinations, to all black.

Straight-grained white pine was selected for the plugs, although cedar will do as well. The pieces were turned to 7/8 in. diameter and 4½ in. long, shaping the end as in the drawing of a sheet-metal template.

The jigs shown in the drawing should be made of hardwood.

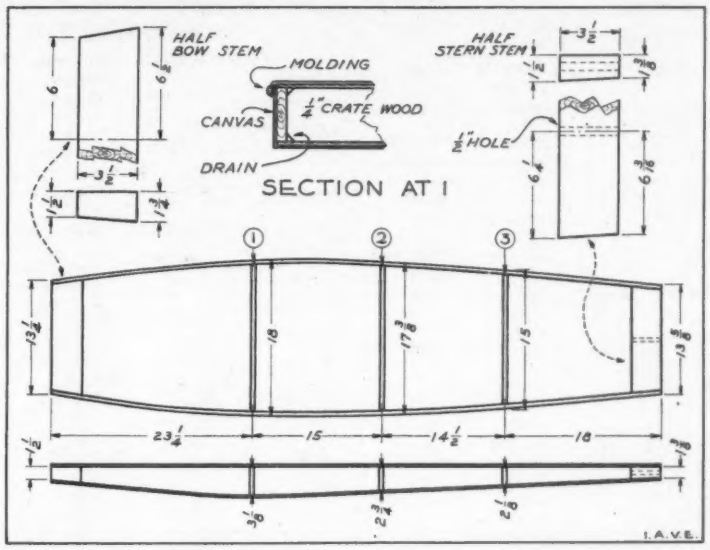
The turned piece is inserted in the jig with the rounded end flush with the square end and the opposite end sawed to the bevel of the jig. Then it is turned over and the saw cut is made for the link. The remaining piece is put in the other jig and sawed to the form shown. The saw cuts are smoothed down with sandpaper.

Pilot holes should be drilled for the brass nails and for the screw eyes. The screw eye for the swivel should next be put in the headpiece and the screw eye for the tail hook should be put part way only in the tailpiece. They are then ready for the paint and enamel, the choice of the colors being left up to the one who makes the plug.

The plug should be gripped in felt or other material so as not to mar the finish when assembling. The tail screw eye should be withdrawn to put in the treble hook.

Consult the fishing laws of your state with regard to the number and type of hooks that may be used, or the sporting-goods dealer may be asked when the hooks are purchased.

The links may be cut out with a hack saw and filed to shape. The nails must be small enough to give the bait freedom for plenty of action.



TWO HOLLOW SURFBOARDS

James McGregor,
Polytechnic Elementary and Junior High School,
Pasadena, California

The simply constructed surfboards described in this article were designed to meet the needs of boys who are especially interested in aquatic sports, but who have little money to spend, or who have not yet arrived at the stage where they can attempt difficult constructional work.

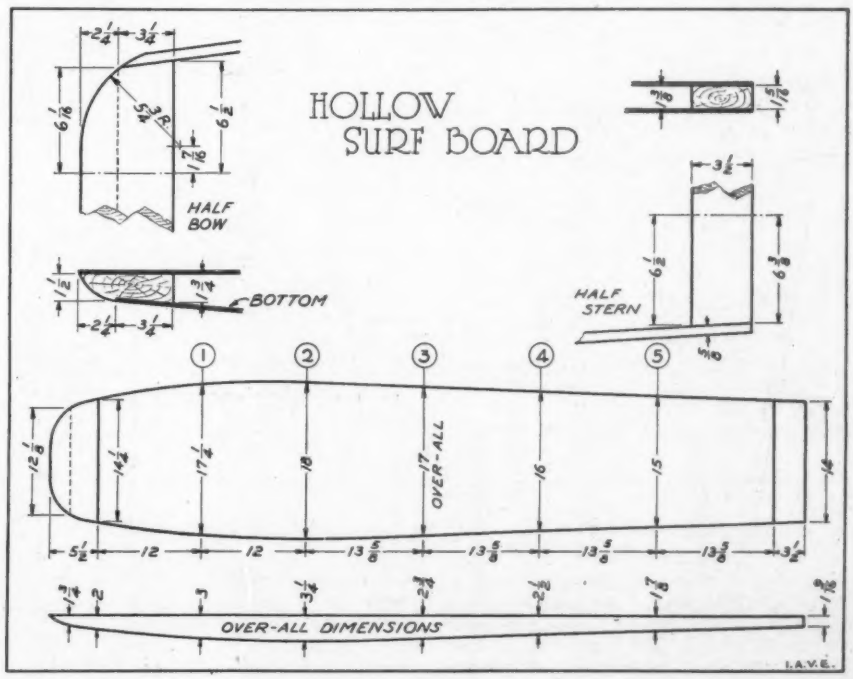
With the shorter surfboard the first step is to make bow and stern stem pieces. Special attention is directed to marking and cutting the bevels, for these determine the bowlike shaping of the sides later on. After making the side pieces and rib No. 1, assembly begins.

To make the construction as simple as possible, the cutting of dado joints in the side pieces to receive the ribs, has been omitted. The side pieces should be soaked in water before assembling to facilitate bending. Casein glue and brass screws are used to fasten sides to bow and stern stems, and clamps should also be used, so that the depth of bend in each side will be the same, making a well-balanced surfboard.

After planing off the edges of the sides flat, drains should be cut at the corners of all ribs. A ½-in. hole is bored at the stern to act as a drain and a breather, allowing for expansion and contraction of the air inside the surfboard. An ordinary cork will serve as a plug for this hole.

Top and bottom may now be applied. Wood salvaged from crates or boxes can be used for this, but uniform thickness of boards and good fitting edges are necessary. Top and bottom are fastened with galvanized-finish nails. Sharp edges should now be rounded off ready to receive the canvas.

Putting on the canvas may be a tricky job in this case, but it is possible to do so and still get all the wrinkles out of the fabric. By cutting a slit in the canvas at the top edge of the sides, where the curve begins, the extra cloth may be pulled out tight, and tacked ¾ in. below surface of deck. This process is repeated at bow and stern on each side of the board. Ends are folded in and tacked, keeping all seams on the sides, next



to the deck. A half-round molding mitered at corners covers seams and tacks. Sponging canvas with water after it has been tacked, will shrink and pull material tight.

The completed board has still to be painted, of course, to make it watertight, and each coat has to be built up, brushed out well, and given ample time to dry.

Bill of Material

2 pc. 5/8" x 3½" x 6'–0"	Straight-grained spruce S4S	Sides
1 pc. ½" x 3½" x 3'–0"	Spruce or white pine S2S	Ribs Nos. 1 and 2
1 pc. ½" x 2½" x 1'–3"	Spruce or white pine S2S	Rib No. 3
1 pc. 2" x 4" x 2'–6"	Douglas fir	Bow and stern
1 pc. ¼" x 5/8" x 16'–0"	Half-round molding	
¼" or ⅜" wood taken from boxes or crates for top and bottom		
1 pc. 48" x 2¼ yd.	10 oz. White duck canvas	
1 doz. 1½", No. 8	F.H. Brass screws	
1 lb. 3d.	Galvanized finish nails	

For painting specifications see article on "12-ft. Paddle Board," pp. 173–175, April, 1940, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

The second or longer surfboard has a few points which are different in construction from the first. The bow stem is rabbeted to receive the bottom. Top and bottom are of tempered prestwood. Before fastening these with 3d galvanized finish nails, ½-in. cotton tape is placed along edges of sideboards, also on bow and stern stems. By setting tape in marine glue a good tight joint is acquired. Inside of surfboard as well as inside of deck is painted two coats of good lead paint.

There is no canvas covering on this board, so that the outside has to be planed off smooth and sanded before painting, with the exception of top and bottom which is already smooth. All sharp edges should be removed.

Bill of Material

2 pc. 5/8" x 3½" x 8'–0"	Straight-grained spruce S4S	Sides
1 pc. ½" x 3¼" x 8'–0"	Spruce or white pine S2S	Ribs 1 to 5
1 pc. 1¾" x 6" x 1'–3"	Mahogany S2S	Bow
1 pc. 1½" x 3½" x 1'–3"	Mahogany S2S	Stern
2 pc. ⅛" x 24" x 8'–0"	Tempered prestwood	Top and bottom
16 1½" No. 8	F.H. brass screws	
1½ lb. 3d.	Galvanized finish nails	
12 yd. ½"	White cotton tape	
½ pt.	Marine glue	
2 oz.	Casein glue	

For painting specifications see article on "12-ft. Paddle Board," already referred to.

A WALL SCISSORS CASE

Raymond L. Harrington,
Everett, Massachusetts

"Where are the scissors?" This question often asked by members of the household has its solution in this practical wall scissors case. After a period of regimentation on the part of the mother, the scissors have an almost uncanny way of wending their way back to the case from whence they were removed.

The design, an adaptation of the Early American fishtail pipe box, will add a mellow note of harmony to any vacant wall space. This particular case was designed to hold scissors of 8-, 6-, and 5-in. length. Each compartment accommodates scissors 1 in. longer than those specified. Any ¼-in. plywood will do. If the case is to be given a "honey maple" finish, whitewood will give the best results.

The entire project may be made from a piece of 24 by 6-in. plywood. Scrap pieces of plywood to be found in any shop scrap pile can be utilized in constructing this wall case.

Bill of Material

Part No.	No. Required	Item	Size
1	1 pc.	Back	¼"x3¾"x11½"
2	1 pc.	Top front	¼"x3" x 3"
3	1 pc.	Middle front	¼"x2½"x 3"
4	1 pc.	Bottom front	¼"x2" x 4"
5	2 pc.	Sides	¼"x2⅛"x 7"

In making the layout on the plywood, use dividers, or a compass, and work from the

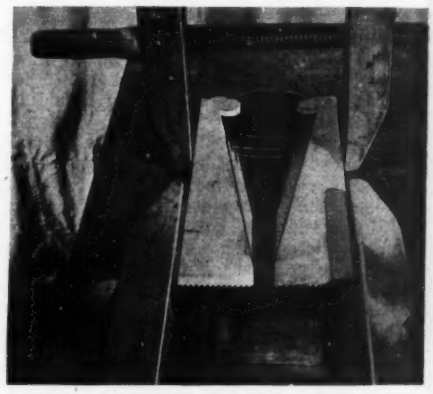
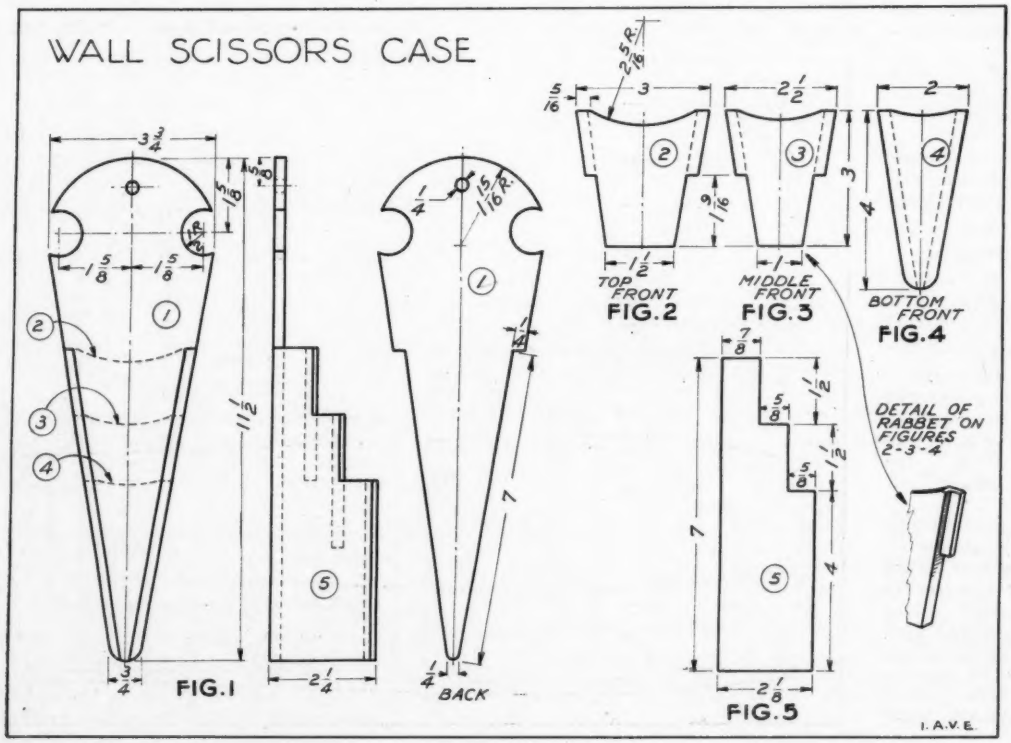


Fig. 6. The jig used in clamping the parts of the scissors case for gluing operations



center line. Parts Nos. 2, 3, and 4 may be laid out in a line on the same center line. If a number of cases are being made, much time will be saved by making patterns of all parts. See Figure 1.

When cutting out on the power jigsaw, keep the face side uppermost, as this prevents chipping of the edges on the front. Cut slightly on the waste side of the line. All of the pieces may be sanded to the line on the disk sander, or with plane and file. A little care should be taken to obtain a straight joint along the ¼ by 7-in. cut on No. 1, as No. 5 is glued to this edge. It is well to leave the ends of Nos. 1, 4, and 5 square, until glued together, when the bottom of the case is rounded off on the disk sander.

Next cut the ⅛ by ¼-in. rabbets on Nos. 2, 3, and 4, after each edge has been squared up to the line. Assemble all pieces temporarily as some file fitting may be necessary at the shoulders to give a good joint.

Gluing will be much facilitated by sawing out two jigs the reverse of the edges of No. 1, and clamp as shown in Figure 2. While gluing the No. 5 sides to No. 1, lay in place Nos. 2, 3, and 4 without glue, as these will keep the sides in place. After removing the clamps from the sides, Nos. 2, 3, and 4, will then be glued in place.

Each piece must be sanded before gluing up. If a *honey maple* finish is desired, first apply a coat of bichromate of potassium to give a golden undercoat. A coat of light walnut water stain is added, tinged with a little antique mahogany. If the piece is sanded lightly with No. 4/0 finishing paper after the bichromate is dry, the water stain will not raise the grain again. Complete the process by applying three thin coats of shellac, rub down with pumice, and then polish.

CLASSICAL BLUEBIRD HOUSE

Earl W. Boyer,
Free School of Mechanical Trades,
Williamson School P.O.,
Delaware Co., Pennsylvania

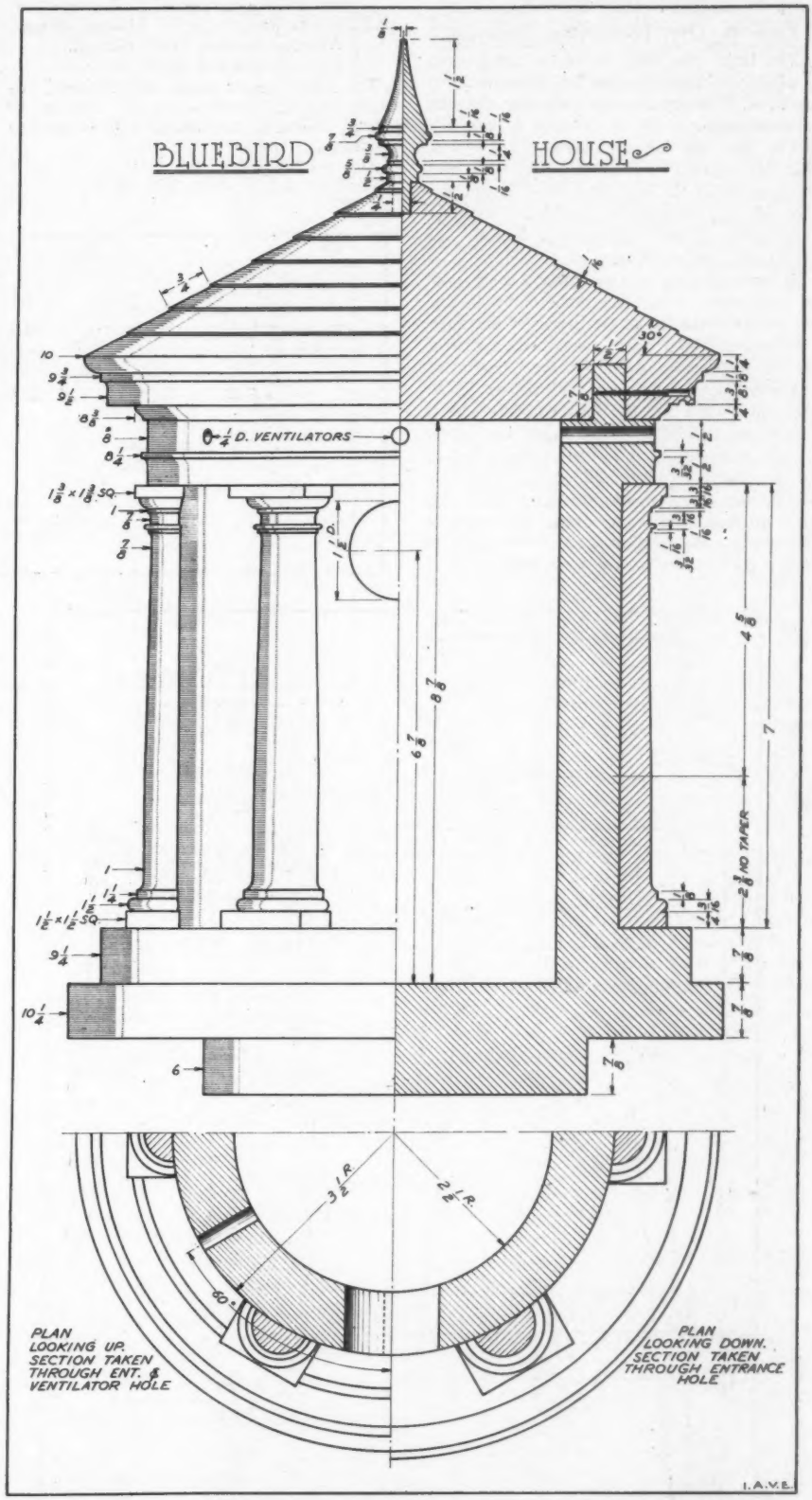
A birdhouse can be so designed as to be pleasing to the human eye and yet be attractive and useful to the birds as a nesting place. Here is one that makes a valuable addition to the lawn or garden scheme of decoration when placed in an appropriate setting, and will blend or add color according to the way it is painted. The house shows the influence of the classical orders in its design, and when placed on pipe or post resembles a small Greek temple.

It seems to be the odor of fresh paint, and not the color that keeps birds from houses.

The one illustrated, herewith, was painted white with a green roof, and red finial. It was mounted about 10 ft. high on 1½-in. iron pipe by means of a flange. It had been painted about a month before putting it up and the odor of paint was practically all gone. Less than two weeks after putting it up it was occupied by a pair of bluebirds.

The whole project is largely a lathe job. The two base pieces may be cut out on a band saw or may be turned and then nailed or screwed together. The body part may be made up of segments and turned or it may be made similar to a split turning and the inside gouged out before fastening the two halves together for turning. Six ¼-in. holes are bored near the top for ventilation, and the entrance hole is bored with an expansion bit. The body is then nailed or screwed fast to the base.

The columns are split turnings. These six half columns are then fitted and nailed against the body. The finial and roof are turned separately and glued together with waterproof glue. Notice that the roof has a circular ½ in. wide groove turned into it which fits down over a tongue turned on the body. The roof is then held down in place by three equally spaced screws which may be removed and the roof lifted off to permit cleaning the house each year.



A KITCHEN STOOL

Leon A. Orr, Bennington, Vermont

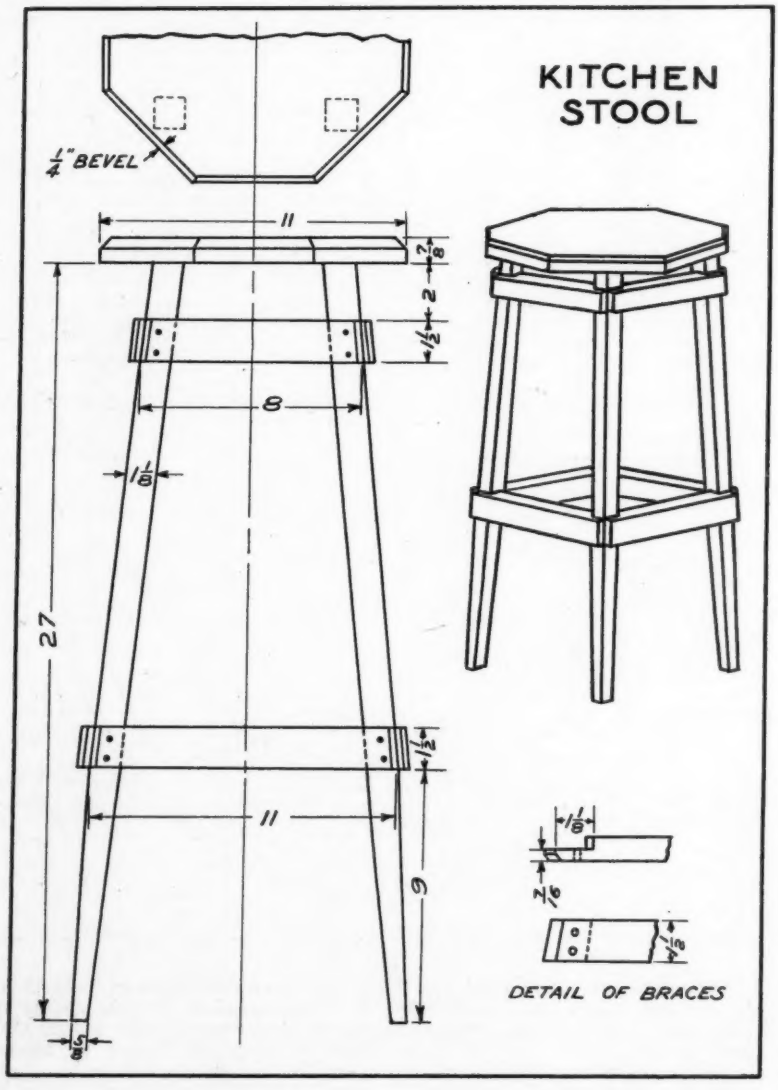
The boys who elect to make the kitchen stool shown herewith must first make a drawing of it. The boy then uses his own drawing to work from.

The legs are cut out of 1⅛ by 1⅛-in. material. Spruce works very well for this purpose. After the legs have been planed and tapered, the crosspieces should be made. A template or a bevel square may be used for laying out the angle cuts.

A demonstration of constructing a lap joint is then given using this same template and the width of the leg as the length of the joint.

When all joints are made and approved by the instructor the boys proceed to fasten the crosspieces to the posts with screws. To be sure of a tight fit, the heads of the screws should be slanted a little toward the center of the crosspieces, and then straightened up as they begin to take hold.

The top is a simple problem in cutting and beveling, while the finish is a coat of flat white paint followed by two coats of inside gloss white, or white enamel.



SPIRAL REAMER

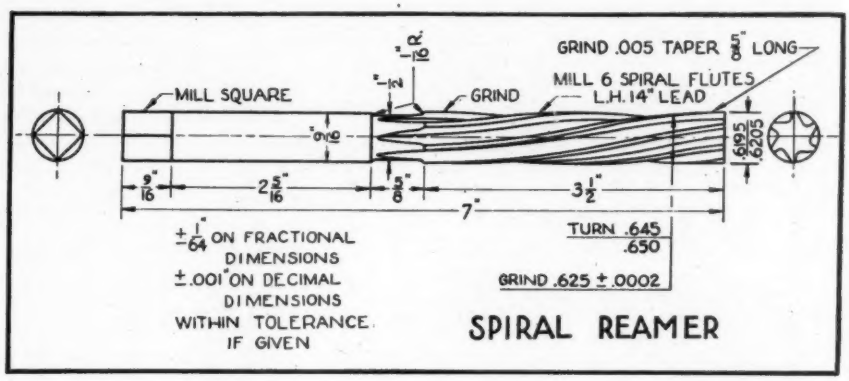
Edwin M. Moe and W. Harold Bugg,
Morton Senior High School,
Richmond, Indiana

The spiral reamer shown was designed primarily to give the pupil practice in spiral or helical milling. It also makes a good grinding operation.

The reamer should be made of 100-point or better carbon steel. The fluted part is turned .020 in. oversize, while the rest is turned to finished size.

The spiral flutes are cut satisfactorily with a B & S No. 3 double-angle cutter and are cut with a left hand lead of 14 in., while the table is offset 7.5 deg. Use 24- and 40-tooth gears for drivers and 24- and 56-tooth gears for followers.

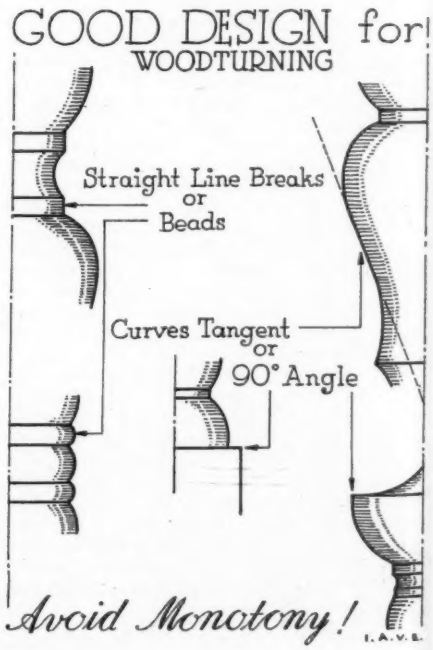
After hardening and tempering rough grind to within .002 in. of size, then raise the wheel for 7-deg. clearance and set up grinder for sharpening a helical cutter and finish grind to size. The table should then be set over so a taper of .005 in. will be ground on the small end for a distance equal to the diameter of the reamer.

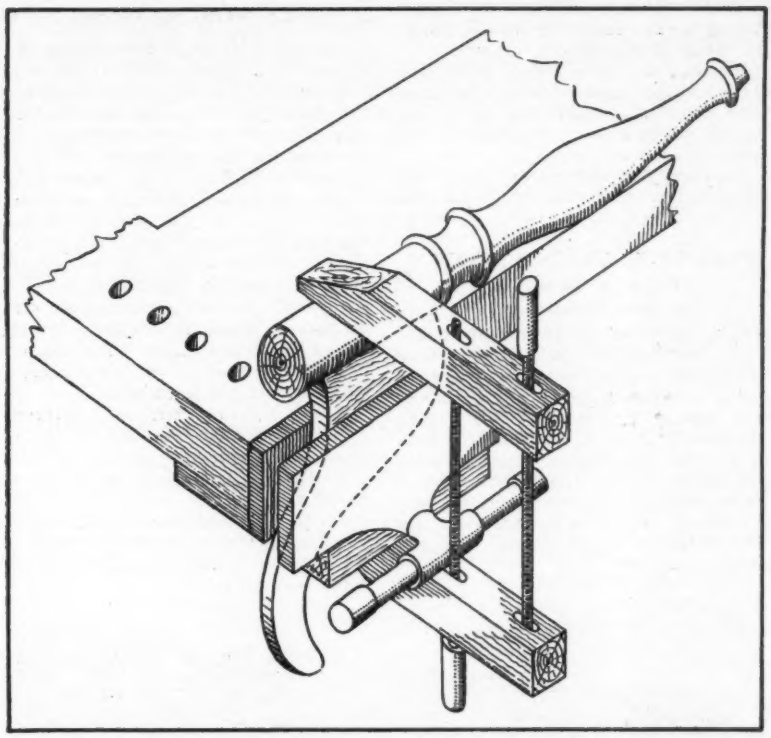


GOOD DESIGN FOR WOOD TURNING

Bert Carr,
State Teachers College,
Trenton, New Jersey

Articles turned on the lathe should adhere to these two simple principles: Make a straight-line break or bead between curves and have curves meet tangent to each other or at 90-deg. angle.





CLAMPING A LEG TO A TURNED POST

Thomas L. Hutchinson,
Johnson City High School,
Johnson City, New York

This is a relatively very easy operation and one boy can do the work handily. A No. 3 or 4 hand screw is all that is necessary. A small block of wood should be placed beneath the vise for a good bearing. There is plenty of vise pressure on the leg and no slipping results — a positive method of bring wood fiber in contact with wood fiber.

ELECTRIC CORD RACK

F. W. Dejmek,
Marinette, Wisconsin

Hanging electric cords used for the flat iron, toaster, waffle iron, and coffee percolator over a nail in the kitchen or closet is a common practice. In doing so a great deal of damage is done to the cords. A simple little rack like the one shown herewith makes an ideal rack to hold cords of that type. The curvature of the rack does not cause a sharp kink in the cords and does not cause the covering on the cords to become frayed. It helps to preserve the insulation that surrounds the wires and also prevents the cords from sliding off, as so often happens when they are hung on a nail. The color of the paint or stain used on the rack will depend on the color scheme of the kitchen. Use two roundhead screws to fasten it to the wall.

EXERCISE BLOCKS FOR TEACHING MECHANICAL DRAWING

W. W. Sturtevant,
South High School,
Minneapolis, Minnesota

Mechanical drawing or technical drafting is a system of drawing used in nearly all mechanical fields. It is the language of industry, and a knowledge of the method of showing objects by means of three or more separate views arranged in a definite relation to each other is fundamental.

The successful draftsman must possess certain skills and a wide knowledge of many things but first he must be able to think in three dimensions or visualize the object he is to draw.

In view of the fact that nearly all, if not all, lists of aims or objectives of teaching mechanical drawing contain the ideal of "developing the ability to visualize" it is not surprising that exercises are in common use by teachers in the drawing rooms. Many teachers see in these exercise blocks an opportunity to offer to their classes a large number of drawing problems in a comparatively short time, and an opportunity to center the attention on the different line combinations used in shape description.

Some teachers object to exercises on the ground that they are not actual machine parts, castings, or stampings. They maintain that exercises do not hold the pupil's interest.

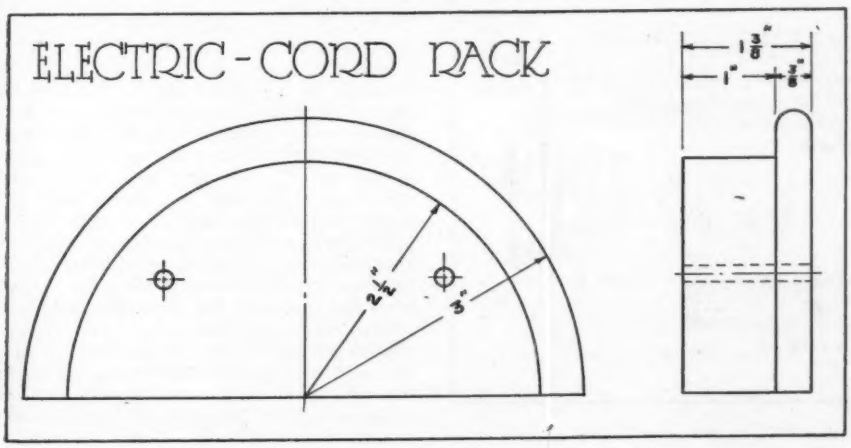
This last objection is not always a sound one as reports from many teachers lead one to believe that if the purpose of the exercises is explained to the class, pupils are very much interested in this type of problem. One reason for this, is perhaps, because it varies the monotony of assignments. In looking over the exercises used by a number of teachers, and those offered in texts and magazine articles one occasionally finds problems that are not clear. In other words the pupil is presented with a problem within a problem. He must first determine what the shape of the block is and then make a correct drawing of it.

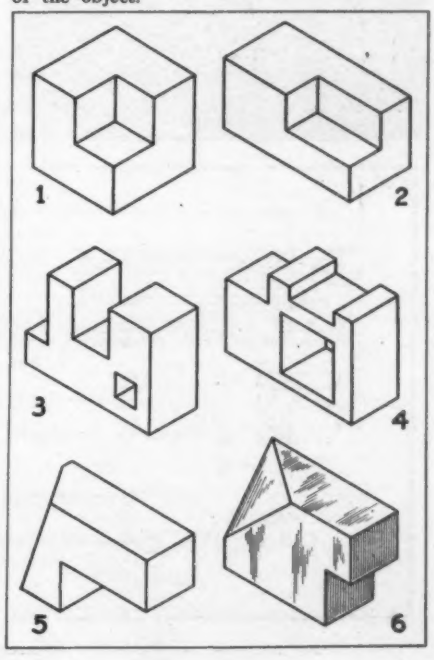
The block shown in the exercise should be very clear and a little forethought would make it posssible to avoid some of the common faults.

It is well to draw a block with three distinct dimensions having length, breadth, and thickness enough different so there will be no confusion in the mind of either pupil or teacher as to which view is shown.

The cube, block No. 1, having three similar views, and block No. 2 with a square end having two similar views, add to the pupil's difficulty when making the drawing and the teacher's difficulty when he is checking it.

Block No. 3 is not good as it leaves room for doubt in the pupil's mind as to the shape of the object.





Block No. 4 shows the same lines but a change in proportions removes any possibility of misunderstanding as to the shape. The farther edge may be seen clearly and it is evident that the hole goes through to the opposite side.

Block No. 5 is not clear and in addition it is disturbing as a piece of such shape would not stand on the small base.

Block No. 6 shows how a change of proportions makes the drawing easier to understand.

It also illustrates the advantage of a few lines to indicate the surfaces. This aids the beginning pupils considerably.

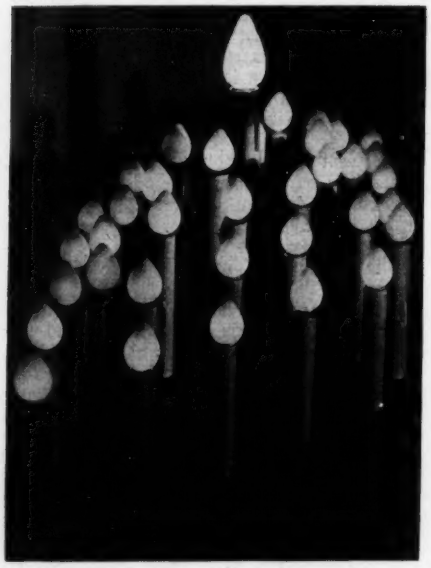
ELECTRIC CANDLE

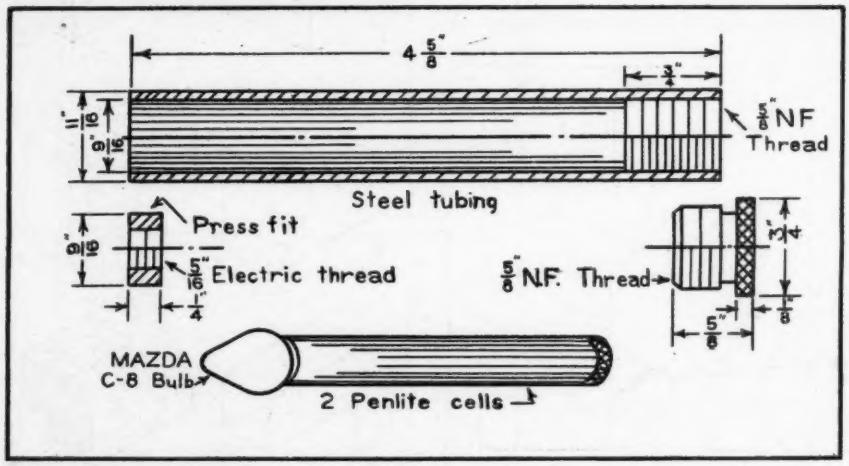
Paul Bell,
Central High School,
Oklahoma City, Oklahoma

It had been a custom of long standing in this city to use candles at initiations into some school clubs. Since some disastrous school fires have been traced directly to open flames at public gatherings and city authorities were becoming more and more vigilant in enforcing the law against fire hazards, the electric division of the department conceived the idea that flashlight candles would solve the problem.

The electric division sketched the design, the drawing division made the working drawing, the machine-shop division did the necessary machining, the cabinet division did the enameling, and the electric division the wiring —a truly cooperative project in which four divisions of the department of vocational and industrial education took part.

The accompanying illustrations show how the flashlights are made and are placed in a frame at the ceremonial.



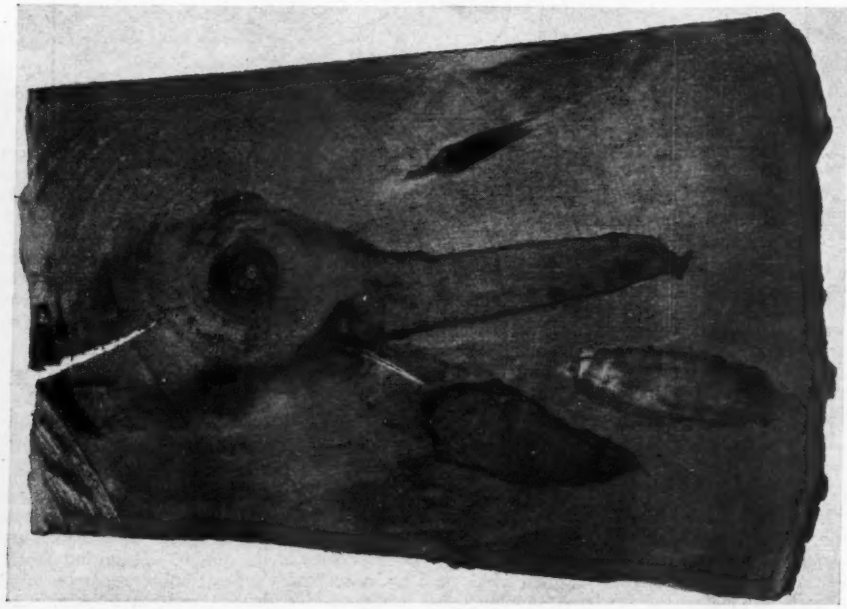


Electric candle

A PECULIAR GRAIN EFFECT

James A. Fenn,
Norman, Oklahoma

Some time ago an acquaintance of the writer found the configuration shown while sawing some hackberry wood. The figure resembles the head of a duck with open mouth and about ready to take in a morsel of food. Viewed from another direction it resembles the head of a jack rabbit. The discolorations producing the odd figures are red and brown. Quite a number of sections were sawed from this tree, but in each one the figure was the same and the red and brown showed through each section sawed.



TOOLS FOR SHAPING GLASS

Milton Berlanstein,
Oswego, New York

In an article, that appeared on page 34, of the January, 1940, issue of this magazine, there were descriptions of different methods of decorating glass to give it a beautiful and interesting surface. Also included in that article was a brief description of how to cut and drill glass easily and conveniently so that the decorated glass may be converted into a project or more fittingly be incorporated with other material. In this article, the author is going to try and further develop the versatility of glass by giving specifications for the construction of inexpensive tools that can be made in the shop to cut many different size circles and shapes in glass.

To cut holes or circles in glass three types of tools are used. The size of the opening desired determines the tool to be used:

a) To drill holes up to 3/8 in., the beveled file may be used.

b) To drill holes from 3/8 to 2 in. in diameter, the brass tube tool may be used.

c) To cut circles from 2 to 36 in. the circle cutter may be used.

When glass is combined with other materials in a project, or used by itself, it is frequently necessary to bore holes to admit screws. The following method of producing these openings is fast and convenient. Grind the end of a triangular saw file or square file into the shape of a pyramid making the surfaces slope at an angle of about 50 deg. A fine drilling edge also can be produced on the file by clamping about half of it in a vise and twisting the protruding half with a wrench. The jagged edge that is produced will give satisfactory results for drilling. When the spot to be drilled has been located, put some putty or artist clay over it and make a depression in its center exposing the glass where the drilling is to start. Now fill this depression with turpentine. Place the glass on a piece of felt, a stack of papers, or a piece of pressboard, and start to drill. The drill mentioned above may be held in the hand, in a breast drill, or in the drill press. Regardless of which method is used to hold the drill, it must be remem-

bered that only slight pressure is used, otherwise the glass will break. A little practice will teach just how much pressure to put on the drill. When the drill begins to work through, the glass should be turned over and the hole finished from the other side.

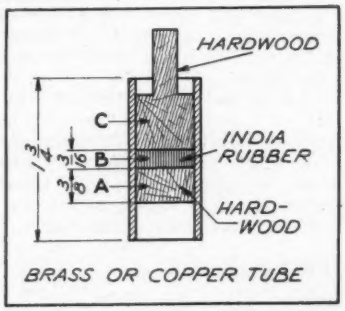


Fig. 1

In the construction of projects in glass or in replacing glass in glazing work it is frequently necessary to make openings in the glass that are larger than ⅜ in. and yet smaller than 2 in. in diameter. As stated above, this can best be done with the brass tube tool shown in Figure 1. This tool consists of a piece of brass or copper tubing of the desired diameter and about 1¾ in. long. The outside diameter of the tube determines the diameter of the opening it will make. A hard block of wood, ⅜ in. thick, is driven into the tube down past the center. Soft India rubber is then put into the tube to a thickness of about 3/16 in. The remainder of the tube is filled with a piece of wood shaped as shown at *C* in Figure 1. These tools are used just as the beveled file except that in addition to the turpentine, carborundum dust is added. In other words the tool revolves in a pool of turpentine and carborundum dust. The protruding portion of part *C* in Figure 1, may be held in a breast drill or drill press for revolving the tool.

The circle cutter shown in Figure 2 is used to cut large circle table tops, automobile lights, picture frames, shelves, and the like. This tool consists of four pieces, the beam, the clamp, the cutter, and the suction cup. The beam and clamp are made of maple or birch or some other hard wood.

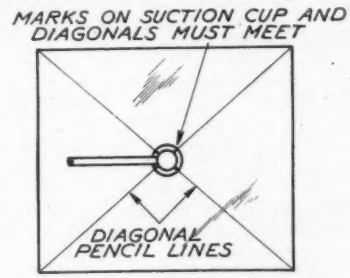


Fig. 3

To operate this cutter proceed as follows: Set it to the desired size. It is advisable to check the size before cutting the circle. Now wet the suction cup and press it on the point that is to be the center of the circle or curve. To center the suction cup, first draw, with a pencil, two diagonal lines to opposite corners of the glass, then place the suction cup so that the four opposite marks on it rest on the diagonals. See Figure 3. Start cutting the

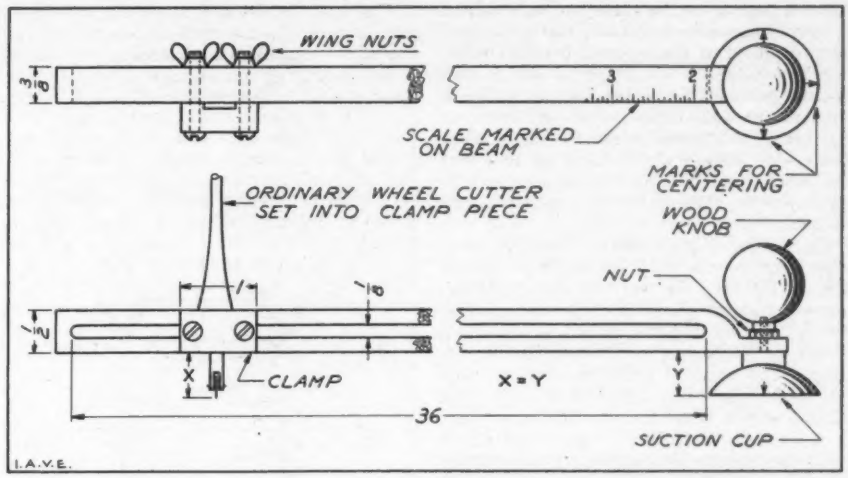


Fig. 2

circle by pressing on the cutter just hard enough to make a fine hair line on the glass. If you press too hard the glass will flake or burn. The cutting action is the same as that of the regular wheel cutter with the exception that the cutting is done in a circle and

Fig. 4

therefore more care is needed to get a continuous cut. If the cutter should skip, go back and cut the blank spaces but take care not to retrace the cut part as this would permanently ruin the cutter.

The removing of the waste from a circular or curved cut is one of the most difficult jobs for the beginner and therefore the following directions should be followed religiously until the skill is developed: First tap the cut until a continuous crack is formed on the line. To remove the waste, make a number of straight cuts touching the circumference of the circle. Continue this cutting until the pieces between the cuts are very small. Now, using the cutter, break off the pieces one by one until the edge of the circle is left smooth and sharp. The necessity of breaking off very small portions at a time cannot be overestimated. Do not hurry this work.

Sometimes it may be necessary to cut an inside curve such as shown in Figure 4. The same method applies; that is, remove small pieces one by one until the final edge remains. Greater care is necessary to remove the waste in this process than in the foregoing. Be careful and go slow.

There is another implement that is called the vacuum-cup glass holder that can find practically unlimited use, as it is equally convenient in the shop as well as for glazing work. The tool as shown in Figure 5, consists of two automobile defroster suction cups and a handle. To use it, merely wet the suction

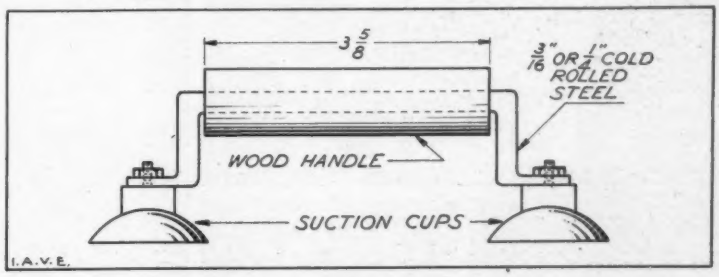


Fig. 5

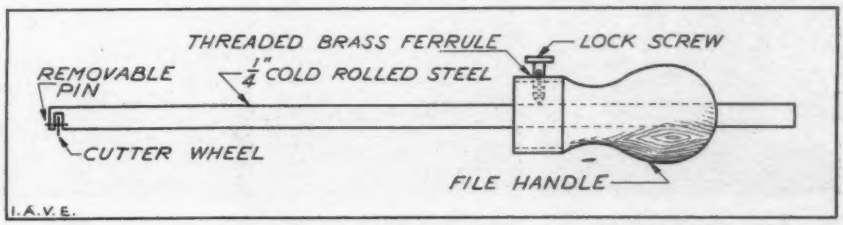


Fig. 6

cup and press it on the glass you wish to hold. It may be used to break the suction created by two pieces of glass placed together either in a rack or shipping box, or to hold mirrors in any position while hanging or fastening them to the wall. Glass shelves or showcases can easily be placed in exactly the position desired for setting with cement or felt, with this handy tool. This tool is so easy and inexpensive to make it is well worth having on hand.

The cutting of glass tubes frequently creates a problem for the shop instructor or for the science teacher. To perform this particular process a gauge glass cutter is used. A very simple and inexpensive model is shown in Figure 6. It consists of a beam, handle, and cutter. The beam is made from ¼-in. cold-roll steel. The handle used is a regular file handle with a brass ferrule. The cutter used is a No. 242 "Red Devil" removable cutter.

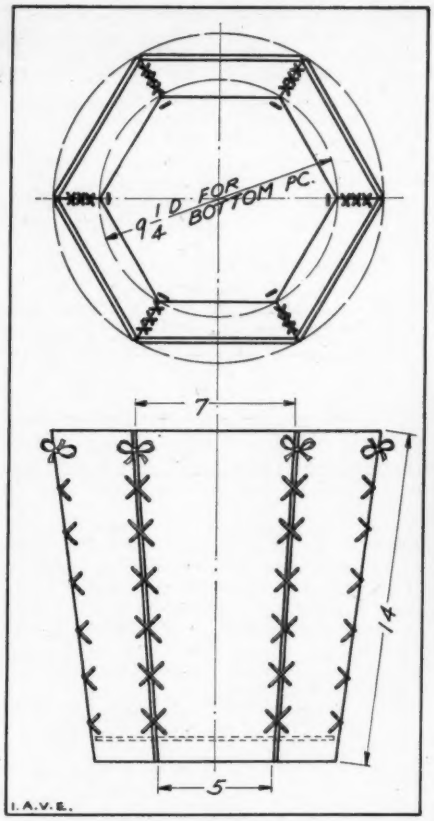
To produce the desired cut with the gauge, press the edge of the tube against the inside edge of the handle and, pressing the cutter against the tube, make a continuous cut around it. Make sure the cut is continuous. Tap the tube at the point where it is cut until it cracks on the line. Pressing on both sides of the crack will part the tube.

With the aid of the tools described, the shop instructor should have little trouble in being able to shape or cut glass into any desired form.

DESIGNING WITH A FIFTEEN-CENT SPRAY GUN

R. H. Jenkins,
Professor of Industrial Education,
Humboldt State College,
Arcata, California

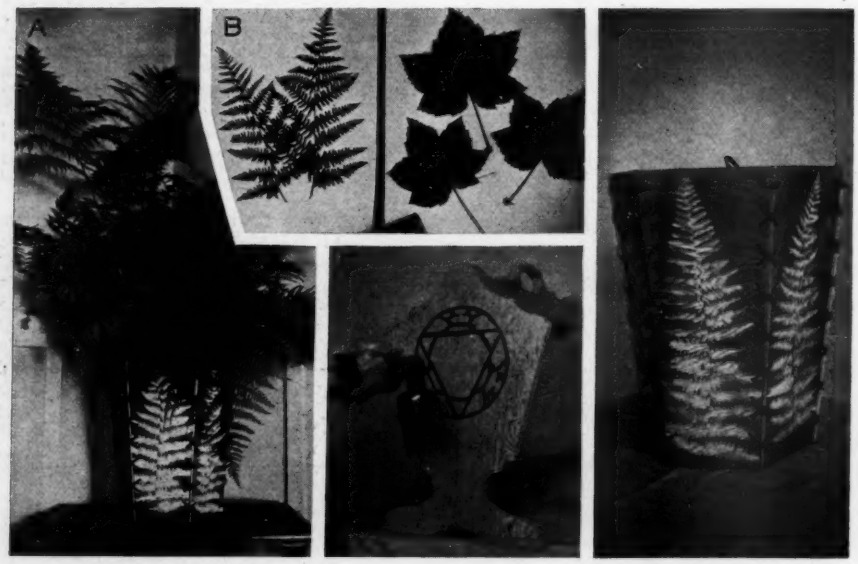
A fifteen-cent spray gun makes possible an interesting line of decorative work. Any color may be used as a background pigment according to the shade desired. The base is cut with gasoline and then sprayed upon the work with the gun. When dry, a coating of clear lacquer is sprayed on to set the color. Asphaltum varnish makes a soft lovely brown and mixes easily with gasoline. Many leaves and flowers



Fern or waste basket

give good results though the fern is really the most attractive.

Pin the leaves or design in place, fastening all points down carefully. Stand at a distance of about two feet and work the spray gun at right angles to the design. Don't hurry the process, as the color might run, but spray long enough to get the color of background desired. Remove carefully so as not to mar the work in taking the design away.



A. Decorated fern basket. B. Some leaves pinned in place for spraying. C. Stencil design produced by spraying. D. Decorated waste basket

PLASTER CASTING MADE EASY

Leland A. Benz and
Lawrence F. Simmering,
Ames, Iowa

Crafts which enable one to produce a project of fine quality and workmanship in a short time, usually have great appeal. Experience has shown that casting projects from molding plaster has such an appeal to the homecraftsman, the skilled artisan, the housewife, the boy craftsman, and most individuals who like to work with their hands. The creation of artistic book ends, lamps, wall plaques, novelties, and other similar projects is brought within the realm of all through the medium of homemade rubber molds. Figure 1 shows a few projects produced in this way.

Fig. 1. A variety of plaster castings

No large investment is necessary to carry on the craft. The only equipment necessary to make both the mold and the project is a small brush and a basin. The projects may be made in the kitchen, attic, basement, or any other available space in the home.

The materials used are quick-setting molding plaster and liquid live rubber. Briefly, the steps embodied are; first, to procure a model; second, to make the mold by coating the model with liquid live rubber; third, to make

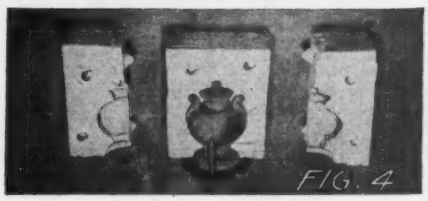


Fig. 2, shows casting and simple plaque mold. Fig. 3. Seamless rubber mold with two-or-more part supporting plaster shell. Fig. 4. Split rubber mold

a plaster shell to support the rubber after it is peeled from the model; fourth, to fill the rubber mold thus made with molding plaster; fifth, to finish the surface of the casting.

The molds may be classified into three types. First there is the simple plaque with a one-piece supporting plaster shell, as shown in Figure 2. Then there is the seamless rubber mold with a two-or-more-part supporting plaster shell. See Figure 3. Finally there is the split rubber mold with a two-or-more-part supporting plaster shell as shown in Figure 4.

Fig. 5. Using a book end as a model. Fig. 6. Spraying on the live rubber. Fig. 7. Brushing on the succeeding coats of live rubber. Fig. 8. Backing the rubber mold with plaster. Fig. 9. Another method of producing the plaster supporting shell

The first step in the making of any of these molds is to procure a model for duplication. This may be done either by purchasing a model or by fashioning one from modeling clay, wood, or some other material. Figure 5 illustrates another method of creating a model. The illustration shows a Lincoln wall plaque made from a bronze book end. To make this model, a book end was greased with machine oil and covered with a ½-in. layer of molding plaster. After allowing this to set for a day, the shell was removed. This shell or negative was then shellacked and oiled in preparation for making a positive which was made by pouring molding plaster into the negative. The model thus produced was glued to a piece of plywood which had been cut and sanded to the desired shape. Slight imperfections and unfinished sections were filled in with modeling clay. The entire surface of the plaque was then shellacked.

After the model has been made or selected it should be sealed to a piece of glass, wood, or cardboard a few inches larger than the model. This sealing may be done either with glue, sealing wax, or modeling clay. If modeling clay is used it should be rolled into small ropelike strings and pressed along the outside edge of the bottom of the model. The surplus clay should be removed with a knife or smooth pointed dowel. Furthermore it should be done carefully so that when the mold is finished, the edge will be clear cut. The model thus prepared will be ready for successive applications of liquid rubber.

If the model from which the rubber mold is to be made has contours that will permit the finished rubber shell to be removed or stretched off without danger of either tearing the rubber or breaking the casting it will not be necessary to make a split rubber mold.

For convenience we have classified rubber molds under three headings and have adhered throughout to the terminology used under the three classifications.

One-Piece Rubber Molds with One-Piece Supporting Plaster Shell

The model having been fastened to a base as described, it is next coated with liquid rubber. It is advisable to spray on the first few coats with a small hand sprayer used in an inverted position as shown in Figure 6. The purpose of spraying is to eliminate air bubbles which may otherwise occur if the first coat of rubber is applied with a brush. Successive coats may be brushed on, as shown in Figure 7, allowing each coat to dry before the next is applied, until a thickness of about 1/16 in. of rubber is built up.

The next step is to make the plaster shell. This may be done by packing the plaster around the rubber-coated model. See Figure 8. If preferred, side walls may be built around the base and the plaster poured, as in Figure 9. The right-hand view in Figure 8 shows the completed plaster shell of the Lincoln wall plaque.

Seamless Rubber Molds with a Two- or-More-Part Supporting Plaster Shell

Molds for book ends, statues, and similar projects may require a shell made of two or more parts. However, the model may be of such nature that the rubber shell may be peeled from the casting as a rubber glove is peeled from the hand. The model should be studied carefully to determine a parting line which will permit the easy removal of all parts of the shell from the casting. If the parting line is irregular one side should be built up with modeling clay as shown in Figure 10. Molding plaster may then be poured against the clay to form the one half of the shell.

After this plaster has set, the clay should be removed and several small semispherical holes about ¾ in. in diameter should be cut into the parting surface of the shell. When the second half of the shell is poured these semispherical holes will form dowels which will serve to hold the two parts of the shell together in the proper position. Before pouring the other parts of the shell the first part should be oiled to prevent parts of the completed shell from clinging together.

If the parting line is straight a form may be built around the model and plaster poured up to the parting line as shown in Figure 11. The two-or-more-piece shell may be conveniently held together with rubber bands cut from inner tubes.

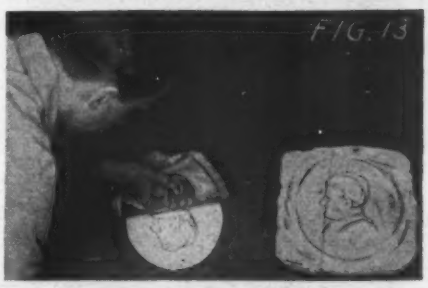


Fig. 10. Using modeling clay to define an irregular parting line. Fig. 11. Making mold when parting line is straight. Fig. 12. Split rubber mold. Fig. 13. Removing casting from a one-piece mold

Split Rubber Molds with a Two-or-More-Part Supporting Plaster Shell

Frequently the contours of a model will not permit the easy removal of the rubber mold unless the rubber mold is split. An example of this is the lamp shown in Figure 12. To make this mold a small cardboard separator cut to fit the contour of the model should be glued in place. The rubber should then be applied to the model, brushing it over and around the cardboard. The shell should be made in the same manner as described under seamless rubber molds with a two-or-more-part supporting plaster shell.

Method of Mixing Plaster

Care must be exercised in mixing molding plaster. It is important that the proper proportion of water and molding plaster is used. A volume of water equal to the amount of mixture desired should be poured into the mixing basin. Into this the molding plaster should be slowly and carefully sprinkled until small mounds of dry plaster begin to appear on the surface of the water. Mix the plaster thoroughly, either with the hand or a spoon, stirring carefully to avoid creating air bubbles. Molding plaster thus mixed sets very rapidly and should be poured at once. To rid the plaster thus poured of any possible air bubbles, jolt the mold on the table. This will cause the air bubbles to rise to the top and break.

Removing Casting from the Mold

To determine whether or not the casting may be removed from the mold feel the plaster to see if it has cooled — the setting of plaster is a chemical reaction which causes heat. The average time required for hardening is about 20 minutes. The shell should then be taken apart and the rubber peeled from the casting. Figure 13 shows a wall plaque being removed from a one-piece mold. Before attempting to apply a finish, the casting should be thoroughly dry. This drying may require several days or a week depending on the size of the casting and the conditions of the room. After the casting is dry, the bottom should be sanded smooth by laying coarse sandpaper on a flat surface and rubbing the casting over the sandpaper.

Finishing

The casting is now ready for finishing. Certain types of projects such as decorative wall plaques lend themselves well to water coloring or to painting with tempera paints. To preserve the finish a coat of clear lacquer or varnish should be applied to the project. Projects may also be finished with colored lacquer or enamel. With this type of finish a better surface may be obtained by first applying a coat of shellac. Still another type of finish, known as antiquing, is easily obtained by first applying two coats of cream enamel or two coats of shellac over which either a coat of brown enamel or a coat of burnt turkey umber and turpentine or linseed oil is applied. The project is then high lighted by wiping off the excess brown with a lintless cloth, before the last coat has been allowed to dry.

A SIMPLE TANNING METHOD

PLATE BY W. BEN. HUNT, HALES CORNERS, WIS., AS EXPLAINED & DEMONSTRATED BY WALTER PELZER.

The method described here can be used at home or at camp, and if properly done, produces soft white skins. If you are not ready to tan immediatly after skinning the animal, stretch the skin on a board or on the north side of some building. Scrape off every bit of flesh, fat and loose particles, rub salt into hide and let it dry. For tanning you will need formic acid (HCO_2H) which can be bought from a druggist, and sulphonated neetsfoot oil, which can be obtained from a tanner or a tanners' supply house. You'll also need water & coarse salt.

• FUR HIDES •

Dried skins should be soaked in cold salt water over night, to soften them. If hide is fresh, rub salt into it and hang it up overnight where it will keep moist. Then with fleshing tool and beam (Fig. 1 & 2) remove every bit of flesh, fat and loose underskin. Use a knife, but be very careful

• BUCKSKIN •

Take fresh hide as is, lay it fur side up and cover hair with clean wood ashes, sprinkle with water & roll up with hair inside. Leave in moist place a day or two. Unroll, wash thoroughly and remove hair and grain or scarfskin with fleshing knife. (Fig. 1 & 2.) Also scrape flesh side clean.

From here on all skins are handled in the same manner.

A FLESHING BEAM is merely a smooth rounded surface upon which the hide is laid while being scraped. A piece of 2"x6" plank can be rounded on one side for this purpose

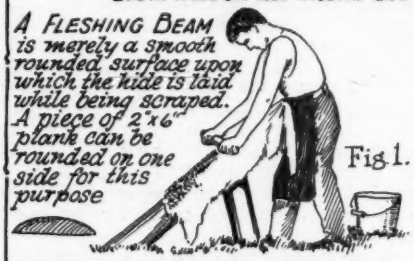
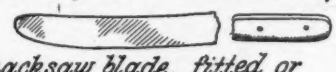


Fig. 1.

A FLESHING TOOL —Fig. 2.— can be made from an old kitchen knife,



or a hacksaw blade, fitted or

driven into a piece of wood. It is

sharpened like a cabinet scraper.

Wash skin thoroughly after scraping.

Soak all skins thoroughly before placing them into the solution.

For skins up to size of coon or fox — Place in solution of 1 gal. cold water, 1½ lbs coarse salt and 18 c.c. formic acid. See that skin is covered and has no air pockets. Let it soak for 2 or 3 days, moving it around occasionally. Then take skin out of solution and add 2 c.c. of formic acid for skins the size of squirrel, and 3 c.c. for coon skin size. Do not add any for rabbit skins.

For calf or buckskins — Place in solution of 1 gal. cold water, 1½ lbs. coarse salt and 20 c.c. formic acid. Treat same as small skins. After 2 or 3 days add 1 to 5 c.c. of formic acid, depending on size and thickness of skin. Stir the additional acid into the original solution. Be sure to take skin out of solution while adding the additional acid.

Use a stone jar for the solution and keep it covered while skins are being tanned. A five gallon jar is about the best size for small skins.

If you have no C.C. (cubic centimeter) graduate, have the druggist put the smaller amount of acid into the bottle, paste a sticker to show the level, and then add the larger amount. When ready to use it, pour out the larger amount first.

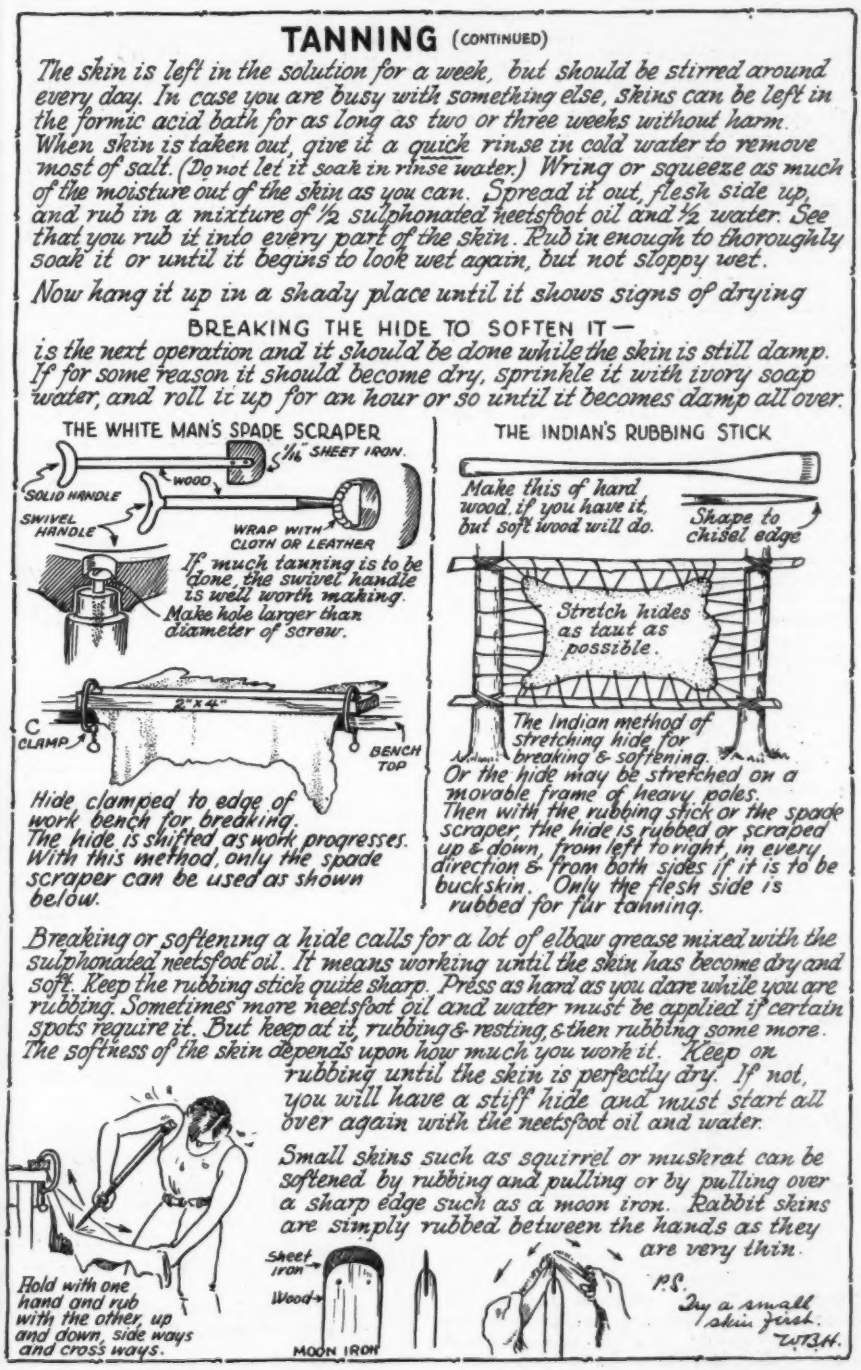
HANDY SORTING PAD FOR SMALL NAILS AND BRADS

Frank Bentley,
Clinton, Iowa

It is not easy to sort out small wire nails and brads as to sizes, because when laid or scattered out on a flat surface, they are hard to pick up.

Sorting pad

To overcome this difficulty, take a 5 by 5-in. piece of corrugated cardboard from a shipping carton, and pull off the thinner or inside sheet. Fasten it to a small block about 1½ or 2 in. high, so that the cardboard is well off the table. Flatten the end of a match or cut the end of a confection stick with a rounding tip so it will go down into the currugations. Then place some of the small nails on this, and with the point of the stick, gather the ones that you need into a groove and push them over the edge of the cardboard into the hand or into a container. In this way, a large handful of small nails can be very quickly and easily sorted.


TANNING (CONTINUED)
The skin is left in the solution for a week, but should be stirred around every day. In case you are busy with something else, skins can be left in the formic acid bath for as long as two or three weeks without harm. When skin is taken out, give it a quick rinse in cold water to remove most of salt. (Do not let it soak in rinse water.) Wring or squeeze as much of the moisture out of the skin as you can. Spread it out, flesh side up, and rub in a mixture of ½ sulphonated neetsfoot oil and ½ water. See that you rub it into every part of the skin. Rub in enough to thoroughly soak it or until it begins to look wet again, but not sloppy wet.
Now hang it up in a shady place until it shows signs of drying
BREAKING THE HIDE TO SOFTEN IT —
is the next operation and it should be done while the skin is still damp. If for some reason it should become dry, sprinkle it with ivory soap water, and roll it up for an hour or so until it becomes damp all over.
THE WHITE MAN'S SPADE SCRAPER
⅛" SHEET IRON.
WOOD
SOLID HANDLE
SWIVEL HANDLE
WRAP WITH CLOTH OR LEATHER
If much tanning is to be done, the swivel handle is well worth making. Make hole larger than diameter of screw.
2"x4"
C CLAMP
BENCH TOP
Hide clamped to edge of work bench for breaking. The hide is shifted as work progresses. With this method, only the spade scraper can be used as shown below.
THE INDIAN'S RUBBING STICK
Make this of hard wood if you have it, but soft wood will do.
Shape to chisel edge
Stretch hides as taut as possible.
The Indian method of stretching hide for breaking & softening.
Or the hide may be stretched on a movable frame of heavy poles. Then with the rubbing stick or the spade scraper, the hide is rubbed or scraped up & down, from left to right, in every direction & from both sides if it is to be buckskin. Only the flesh side is rubbed for fur tanning.
Breaking or softening a hide calls for a lot of elbow grease mixed with the sulphonated neetsfoot oil. It means working until the skin has become dry and soft. Keep the rubbing stick quite sharp. Press as hard as you dare while you are rubbing. Sometimes more neetsfoot oil and water must be applied if certain spots require it. But keep at it, rubbing & resting & then rubbing some more. The softness of the skin depends upon how much you work it. Keep on rubbing until the skin is perfectly dry. If not, you will have a stiff hide and must start all over again with the neetsfoot oil and water.
Small skins such as squirrel or muskrat can be softened by rubbing and pulling or by pulling over a sharp edge such as a moon iron. Rabbit skins are simply rubbed between the hands as they are very thin.
Hold with one hand and rub with the other, up and down, side ways and cross ways.
Sheet iron
Wood
MOON IRON
P.S. Try a small skin first. W.T.H.

RULES FOR THE FINISHING ROOM

Eugene W. Frank,
Washington Junior High School,
Jamestown, New York

A reminder to those who are about to use the finishing room.

Many teachers in the metal shop and possibly in other junior-high-school shops, may find the rules submitted herewith adaptable to their own situation, either directly or indirectly.

The finishing room is but a small part of the school shop, but it is an important one. Every device which aids in keeping the finishing room clean and orderly is, therefore, to be welcomed.

The following rules have been found to serve well.

Suggestions to the Student

1. Always cover the top of the bench with old newspapers. Be economical, use only two sheets (4 pages). They are on the shelf below the working surface of the finishing bench.
2. Paint brushes that have been in dark colored paint should not be used in a lighter color.
3. Similarly, paint mixing sticks used in a dark colored paint should not be used to mix a lighter color.
4. Clean the paint brush immediately after using. It is much easier to clean it then, rather than waiting till some of the paint has dried on the bristles.
5. Wipe off, immediately, any paint that may be accidentally spilled on the bench top, walls, floor, shelves, or on some other boy's project.
6. Be sure all paint-can lids are fastened tightly before you leave them. Paint will dry out if exposed to the air.
7. Use aluminum and bronze dust sparingly.
8. Put all used rags and paper towels in containers provided for that purpose.
9. The finishing room is small. If more than three or four boys work in it at one time, it is overcrowded. It will be almost impossible to do good work in such close quarters. Anyone not actually using the finishing room will, therefore, help those working there by staying out.

Help keep the finishing room neat and clean.

"Vocational education is that form of education that helps a man to get a job, hold a job, or get a better job." — *Charles R. Allen.*

TANNING

W. Ben. Hunt,
Hales Corners, Wisconsin

The essentials of tanning are described on the accompanying plates where every operation is shown and explained. However, a few additional words may help the beginner.

Removing hair and scarf skin in one operation

In the first place, do not try to tan a large skin at the outset. Make your first attempts on small skins, like a red squirrel skin, for instance. These can be tanned very easily, and will give the beginner a better idea of the entire job, and show him how simple tanning really is. Small skins can be tanned in a glass jar or a large wide-mouthed bottle such as druggists use. The skins may be kept in such a bottle for a long time if well covered with the tanning solution. A common kitchen knife can be used to soften the skin. Softening the skin is really the breaking up of the fibers. Small skins may be tanned in the kitchen as there is no odor, and the job produces no more dirt than does the cleaning of a chicken or a mess of fish.

PRESSWORK PROCEDURE

John Brophy,
Milwaukee, Wisconsin

Incidental to the operation of any mechanical equipment are many factors, minute in themselves, yet essential if satisfactory workmanship is desired. To facilitate the understanding of basic steps involved in doing presswork on a platen press; to encourage a uniform method of procedure in presswork; to lighten the burden on the student's retentive faculties which are often overburdened with details which are largely habitual practices; and to increase the effectiveness of the demonstration, the following sheet may be used in vocational and trade schools with success.

Present procedure is to distribute the sheet to the students and have them alternate in reading the directions to the demonstrator.

After the demonstration, the sheets remain in the students' hands to be used as references in actual practice.

While shop organization in different schools will naturally vary details of the procedure specified, and while job requirements will occasionally call for similar variations, sound trade practice and pedagogical judgment will confirm the practicability of the following outline:

Presswork on the Platen Press

Premise: Job has been set by composing-room student.

Procedure:

1. Check through job ticket to see what must be done on the job.
2. Oil the press.
3. Check form carefully, yet quickly for: Location of job in chase, lifting, position of quoins, types of cuts, types of quoins and tightness, half tones, originals, binding furniture, zincs, nickle plates, sprung chase, amount of solids.
4. Choose ink for job, keeping in mind color, opacity, consistency, transparency, permanency.
5. Ink press, putting a little on the edge of the disk, allowing the ink ample time to distribute itself uniformly.
6. Check rear of form and bed of press for dirt, filings, etc.
7. Insert the form in press.

Unless otherwise specified, always put the form in the platen press, with quoins on the upper and right-hand side. Check grippers to see that they will not hit form.

8. Remove the old packing.
9. Prepare new packing, consisting of: One pressboard, three sheets of S and SC packing paper, one sheet manila tympan paper. Crease the manila and S and SC lengthwise at one edge for about ¾ in. Put creased edges in bottom bale, insert pressboard, and draw sheets tightly up over platen, locking them in place with top bale. This constitutes what may be termed a medium packing.
10. Pull impression on tympan.
11. Level platen, if necessary.
12. Mark out underlaying, and if necessary, do interlaying now.

NOTE: Underlaying small weak spots on cuts is ineffective, interlay instead.

13. Locate gauge pins and get O.K. on position and corrections. Set gauge pins in about one sixth of the distance from each end of the sheet and on the side about one fourth the distance of width of sheet.
14. Pull another impression on S and SC packing paper, over a piece of the regular stock to be run. Stab its position on the platen, without moving it.
15. Mark out the overlay on this sheet. Indicate low spots with a series of circles indicating the number of patches needed to level the form. Mark folio areas with an F; tissue areas with a T; cutouts with an X; and those areas that need a piece of the same substance as the job itself, mark with a 0.
16. Register this make-ready in position with the stab marks on the lowest sheet of the S and SC packing paper. Paste make-ready securely in place, avoiding lumps in pasting, and remove one sheet of S and SC.
17. Pull another impression using same procedure. If needed, a second overlay may be applied as in the first instance. Otherwise, circle the few remaining places needing make-ready, and put patches in corresponding places on the overlay.
18. Regulate impression now by substituting different weights of paper.
19. Check ink again and set the fountain for the run.
20. If needed, set grippers so that they strip sheet off form.
21. Run ten or fifteen consecutive sheets with fountain fully set.
22. Secure a final O.K. from the foreman, presenting job ticket with sheet.
23. File job ticket and proceed with the run. In transferring sheets to delivery table, make no effort to job them. Carefully transfer all printed sheets to drying racks.
24. Remove form from press.
25. Wash up press.

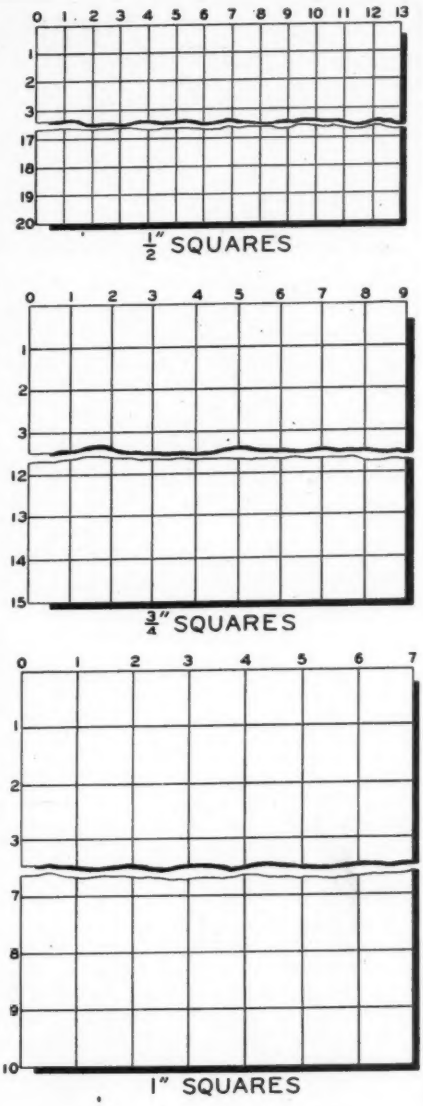
CROSS-SECTION PAPER FOR THE SCHOOL SHOP

H. R. Buros,
Director, Industrial-Arts Department,
High School,
Malverne, New York

In industrial-arts work, we usually encourage students from the outset to plan their prospective jobs. One phase of planning has to do with the enlarging or decreasing in size of objects usually found in magazines and books. These objects or projects that need enlarging are usually squared to facilitate the sketching of curved lines through plotted points by the freehand method.

Students hesitate in making enlargements if the proper sized squared paper needs to be drawn each time. The use of ¼-in. cross-sectioned paper is somewhat costly and also confusing to the students when larger squares are required. The writer has cut stencils and has mimeographed different sized squares of cross-sectioned paper during the past year and has found it very helpful in his classes. Then, too, the cost of this type of paper is considerably lower than if the regular printed ¼-in cross-sectioned paper is used.

This mimeographed cross-sectioned paper



having ½-, ¾-, and 1-in. squares is available to students for their enlarging, reducing, and planning of projects at all times.

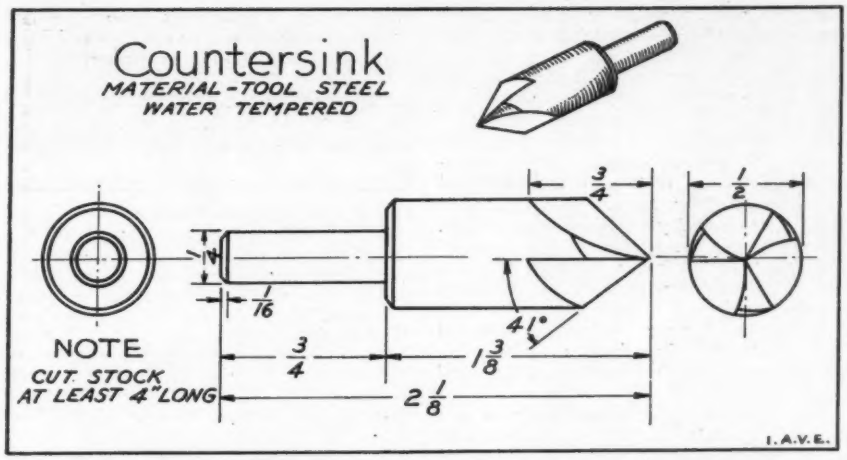
As shown in the illustrations the squares on this mimeographed paper are numbered. This assists greatly in laying out the points for a given drawing. If necessary, two or more of these mimeographed sheets may be pasted together for making a larger drawing.

COUNTERSINK

C. W. Blakeslee,
High School,
Hastings-on-Hudson, New York

The machine-shop project described herewith was originally designed because the nature of its construction lent itself admirably to a series of operations requiring only a short time to complete with the result that the student realized immediate satisfaction.

In successfully completing this project a student familiarizes himself with the following machine-tool processes: Cutting metal with hack saw, taper turning on the lathe, indexing, lathe turning, grinding, heat treating, and polishing.



Method of Procedure

First a 4-in. piece of ½-in. machine steel is cut off with a hack saw. This piece is then chucked in the lathe and the end turned to an angle of 82 deg. which is correct for a countersink for machine screws. The piece is then chucked in the dividing head and the three slots "milled" in order. At this stage the student should be very careful in adjusting for the depth of the cut. Since the end is pointed this fact is used as a gauge and the milling cutting is adjusted so that the cut does not quite reach center.

After making the three cuts or slots, the piece is then taken to the lathe, chucked, and the other end turned as shown in the drawing. The next step is to "back" off the cutting edge similar to the process used when sharpening a drill to give it the proper clearance for cutting. When this operation is completed the piece is taken to the gas furnace and heated until it is red hot. It is then withdrawn and the cutting end partially quenched, polished, and watched until the blue temper color runs down to the cutting edges. As soon as this color is observed the entire countersink is quickly plunged into cold water. The next step is to polish it in the lathe using a fine grit emery cloth.

The real satisfaction that comes from completing this project is the test which all students should make. If the countersink stands up under test on a piece of mild steel the student may feel that he has produced a good tool.

Smaller or larger diameter countersinks may be made in exactly the same manner except that caution should be followed when working on the smaller diameters. These pieces should project from the various chucks holding them only as much as is absolutely necessary for the proper clearance of the cutting tools. A number of these countersinks of various sizes makes a fine set either for the school shop, or for home use.

PRINTING TEACHERS MEET FOR DISCUSSION OF MUTUAL PROBLEMS

The National Graphic Arts Education Guild will meet at the Rochester Athenaeum and Mechanics Institute, Rochester, N. Y., on June 30, July 1, 2, and 3, 1940, for a down-to-earth series of symposia, or clinical discussions, on all phases relating to the teaching of printing.

"Symposia," in a broad sense, means the free exchange of ideas. To make the conference as valuable as possible for teachers in the three levels of printing education, each list of questions will be discussed in separate groups, because of the differences in objectives and shop equipment in junior, senior, and vocational and trade schools. This means that there will be no emphasis on either industrial-arts or vocational printing education — both will have equal stress.

Short talks, giving industry's slant on printing education, will precede the symposia sessions. Speakers will include Craig R. Spicher on Presswork, Howard N. King on Layout, John M. Collins on Hand Composition, and J. Henry Holloway on Related Subjects.

The entire list of questions for discussion follow.

Type Composition

1. How far should one go in teaching hand composition of straight matter?
2. Is the average school now equipped for teaching anything other than straight-matter composition?
3. What part should the instructor take in production work Can the students do it? Should the teacher do it? Where production must be done to hold one's job, how can composition best be handled to really teach through the doing of it?
4. What devices are in use for keeping cases clean?
5. What, if any, typecasting machines should be included in the shop?
6. What instructional material is available, and what kind is needed for teaching composition at this level of education?
7. Can any standards be set up as to what constitutes a good course of study?
8. When a teacher finds the type of instructional material he wants, is any difficulty encountered in its purchase for student use?
9. Where automatic machinery, i.e., linotype and intertype machines, monotypes, mitering machines, saw trimmers, etc., are not in shop equipment, what can be taught concerning them?
10. Criticism has been made of printing teachers who have practically no actual experience as printers. Is this necessary in this strata of printing education? Why?
11. In the senior high school, what can be stressed to really take an adequate step beyond the work of the junior high school?
12. How can the installation of one linotype or intertype be justified?
13. What can the teacher do to keep up with the advance of type composition?
14. Should layout be taught in hand composition, or in a layout class?
15. What can be done to make contact with employing printers in the use of graduates in the composing rooms?

Presswork

1. Just how far can an adequate "insight into the industry" be had in shops equipped with platen presses only?
2. Should all students be required to know how to feed a platen press? At what minimum speed, to register?
3. What grade students should learn the operation of platen presses?
4. Where production is a problem, how can the pressroom best be run to "get out from under"?
5. To what extent should make-ready be taught to students of this level of education?
6. On rush jobs, should the teacher do all make-ready? Why?
7. Does adequate instructional material exist, or should the teacher teach by word of mouth and by demonstrations?
8. Can standards be set up for adequate presswork instruction?
9. In a platen-press shop, what can students be taught about automatically fed platens, cylinders, non-offset guns, mechanical overlays, etc.?
10. Should the teacher in this type of school be an experienced craftsman in presswork? Is any practical knowledge necessary?
11. What safety measures can be taught, and how can this teaching best be done?
12. In the senior-high-school shop, what can be stressed to really take an adequate step beyond the work of the junior high school?
13. Can the installation of automatic presses be justified?
14. What can the teacher do to keep up with the advance of presswork?
15. What can be done to make contact with employing printers in the use of graduates in the pressrooms?
16. Should presswork teachers attempt to write, edit, and print their own instructional material? Or should they secure a good text and prepare lesson material around it?
17. Is there any instructional value in feeding a platen by hand, after the student has learned the necessary skills? Is this a prevalent practice? Why?
18. Can standards be set up for teaching presswork?

Layout

1. To what extent should layout be taught? Is layout instruction necessary, apart from shop-work?
2. Is it feasible to try to tie up layout with the art department or the mechanical-drawing class?
3. What can the instructor do to improve the design of his shop printing?
4. What instructional material is available, and what is needed for teaching layout?
5. Should the printing instructor consider formal art training as a prerequisite for his job?
6. Where the teacher has a great deal of production, how can layouts be made for the betterment of the education of the students?
7. Should the teacher prepare type specimen sheets of faces in his shop for his own use and the use of his students?
8. What type faces should be added to a shop at the present time?
9. If one wants to lay out a new printing department, what type faces should be recommended?
10. What should the student be taught about the duties of the layout man, his salary, working conditions, etc.?
11. It has been said that school printing is of low typographic quality. If this is true, what can the instructor do to improve it?
12. Can standards be set up for teaching layout?

Related Subjects

1. Of what importance is the history of printing? Should it be a course by itself, or included in another course?
2. Is it necessary for a related-subjects teacher to have any practical knowledge of printing? Should he be a printer? Why?
3. Which of the following courses are important enough to be taught?
   a) English, or printers' English.
   b) Accident and health hazards.
   c) Psychology.
   d) Economics.

e) History of printing.
f) Actual related subjects, such as machine composition, electrotyping, stereotyping, photoengraving, photography, papermaking, paper, copperplate engraving, lithography, collotype, and gravure.

4. What courses should be added to the above list?

5. Are related-subjects courses not really "related"? If not, what can be done to remedy the situation?

6. Should statistics, putting printing and publishing in their order in the major industries, be taught?

7. Should the following be incorporated into a course: number of workers in the industry, average national and local salaries, etc.?

8. Should the duties of workers be taught in the related-subjects class?

9. Can standards be set up for related subjects?

MAKING SCHOOL CORRIDORS MORE ATTRACTIVE

Francis J. Coyte,
Clifford B. Connelley Vocational High School,
Pittsburgh, Pennsylvania

Shop doorways and corridors in the public schools can be made more attractive with colorfully illustrated plaques that can be designed and built by the students. Unfortunately, many shop instructors have neglected the outward appearance of their shop doorway entrances and have overlooked a good opportunity to advertise their departments. This may be due to the fact that the hallway or corridor leading to a particular shop may be dark or unattractive. If this be the case, install a well-lighted display in a conspicuous place over the doorway out of reach of pranksters.

On the other hand, the problem is more acute and perplexing in our modern vocational high schools where numerous shops line both sides of well-lighted corridors where no distinguishable signs of craft or trade are visible. The casual visitor or parent is bewildered at the sameness of all doorways and, because of this lack of identification, student guides must be sent with guests to identify the various departments.

True, the shop entrance has no direct bearing on the proficiency and thoroughness with which the training program functions within a given shop or group of shops, but there can be visual proof pride in craftsmanship that reaches beyond the confines of the shop itself. How much better it would be to have visitors survey the doorway or corridor as the case may be, see a colorful plaque or sequence of plaques representing vocational activities that would convey a desirable first impression.

During the past nine years, a variety of nondescript shop signs of various kinds; plain boards with painted letters, cutouts, sheet-metal card holders, neon signs, and bracketed models, made their appearance in the shop corridors of Connelley Vocational High School. Many were humorous, "ye old ——— shop," diagonally cut birchbark sections and log slabs, all of which were dull and unshapely. The first cardboard lettered signs were hung when the building was opened in 1930 and only recently has there been a complete reorganization and standardization of sizes and general design.

This corridor improvement program was suggested as a class project, to several senior groups before graduation, and sufficiently in advance to contribute to the 10th anniversary celebration of the school. The idea was voted upon, and during succeeding months funds were made available through senior class activities to pay for needed materials.

Inspired by student council support, the commercial art and woodworking departments took over the task of designing and constructing these plaques as a school project in modern art display.

The style of plaques first considered were patterned after historical craft guild shields and later changed to flat bas-relief displays because of automobile and truck movements in the shop corridors. This change in design was made to avoid damage to craft shields that would require projecting bracketed supports.

The project was of sufficient local interest that photographs were made and published in the school-page section of a morning newspaper. The cuts were borrowed and reproduced in the school newspaper, and finally sent to graduate groups that were anxious to know how their plan was working out. Incidentally, the publicity given to this project aroused similar interest in other vocational schools throughout the country.

This project is a specific illustration of genuine student interest and participation made possible through school activities, and the unselfish cooperation of several shop departments for the betterment of the entire school.

Connelley's 10th anniversary will be celebrated early in June with visible proof of student thoughtfulness, foresight, appreciation, generosity, and pride in craftsmanship.

Answers to Questions

Blonde Finishes

1058. Q.: Several of my students are constructing furniture pieces of contemporary design and would like to finish them in bleached or blonde finish which is so prevalent in commercial pieces. We would also like to finish projects of Philippine mahogany and alder in blonde or white finish. If a bleaching agent is required, will you please send me the formula and application procedure? We would like to use lacquer sealer and flat lacquer as a finishing medium. — *G. L. S.*

A.: I question the value of trying to teach blonde finishes in a school shop, since these are but temporary at the best, have but little harmony with all the other furniture in the homes in which they will be placed, and worst of all can only be had from the manufacturers in large factory quantities. It is out of the question for you to produce blonde finishes without spray guns, special bleaching liquids, special bleaching lacquers, and other materials as well. Rather spend your time on something worth while as far as good walnut and mahogany finishes are concerned rather than attempt something of doubtful value. If you feel that you must still carry out your bleaching ideas, write to Lawrence-McFadden Company, Philadelphia, Pa., and they will supply you with a minimum gallon lot each of the Bleach "A" and "B." Follow their instructions carefully. — *Ralph Waring.*

Personal News

♦ G. F. Weber, director of vocational education in South Bend, Ind., has been invited as guest instructor for the 1940 summer session of Indiana University at Bloomington, Ind. He will offer courses in curriculum construction in industrial arts and in the organization and administration of industrial arts. During the summer session of 1938, Mr. Weber directed a seminar that developed courses of study materials, which was published by the Indiana State Board of Education under the title, "Instructional Aids in Industrial Arts."

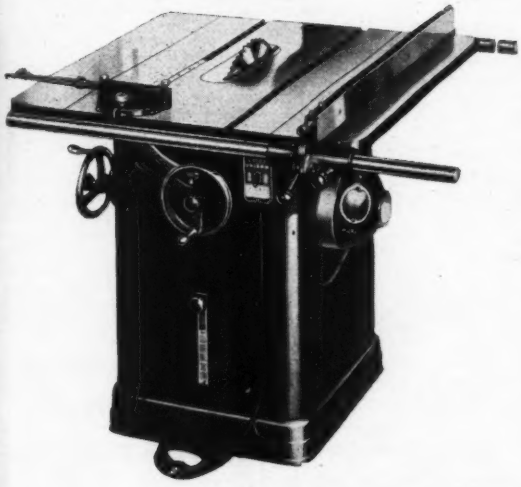
(Continued on page 11A)

Modernize With New Low Cost Tools

No. 1340 Shaper complete as shown without Motor or Switch, $89.50.

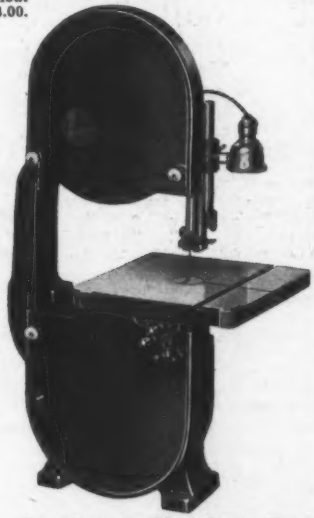
No. 1206, 4-speed Scroll Saw Unit complete as shown without Motor or Belt Guard, $39.70.

No. 666, 6-in. Jointer complete as shown without Motor or Switch, $73.00.



No. 1450, 10-in. Tilting Table Unisaw complete as shown without Motor, Switch or Side Wings, $89.50.

Within the limits of a small budget you can bring obsolete or inadequately equipped school shops up-to-date with the new type low-cost industrial power tools. By using Delta tools many schools have modernized their shops at 25% of the investment formerly required, and at the same time gained other advantages—such as savings in space, lower operating and maintenance costs, more adequate safety features and immediate delivery. The story of how to teach more pupils for less cost is told in full in the new 1940 catalog of Delta Industrial Power Tools.



No. 890, 14-in. Wood Cutting Band Saw without lamp attachment, $48.85.

FREE new Shop Layout Book containing numerous photographs and floor plans of actual school shops submitted by vocational instructors from all over the country. Shows ingenious solutions of the problems of lighting, space, safety and efficiency.

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For Schools Giving Modern Shop Courses

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Availability of a wide selection of tastefully designed projects brings the benefits of a complete instruction course within reach of schools everywhere. These prints are adaptable to all types of shops where metalwork can be taught. *No further layout work required.* Students can work directly from these large, clear prints. The projects require no expensive equipment and make use of standard sizes of metals, obtainable locally.

601 Modern crescent candlestick
602 Modern swing candlestick
603 Modern scroll candlestick
604 Window shelf
605 Small hanging shelf
606 Filigree book rack
607 Cuckoo Bird door bell
609 Two wall sconces
610 Woven wire fruit basket
611 Colonial star light
612 Tall-glass server
613 Beverage serving basket
614 Lyre ivy trellis
615 Spire plant stand
616 Plant wall bracket
617 Small hallway mirror
618 Decorative mirror
619 Book end designs
620 Magazine basket
621 Magazine caddy
622 Aluminum tray-table
623 Three-section table
625 Colonial toaster and fork
626 Three ash trays
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636 Folding fire screen
639 Sectional bookshelves
641 Zodiac andirons
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STANLEY TOOLS
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(Continued from page 256)

♦ Milo T. Oakland, head, department industrial arts, Northern Illinois State Teachers College, DeKalb, Ill., was elected vice-president of the Illinois Industrial Education Association in charge of industrial arts, at the convention held at Chicago, March 14–15.

♦ Ray Boyer, former student assistant in linotype operation and mechanism at Kansas State Teachers College, Pittsburg, Kans., is teaching printing this year in Chanute, Kans.

♦ L. E. Wilson, former school superintendent at Osceola, Nebr., will be placed in charge of a new program at Kearney, Nebr., in which the school and vocational departments of the state industrial school will be co-ordinated.

♦ Frank Borgna, former instructor of printing at Halstead, Kans., is now head of the printing department of Altamont, Kans.

Association News

♦ During the March meeting of the North Texas Section of Industrial Education in Dallas, Tex., a group of shop and drafting teachers decided to form an Industrial Arts Club. The place of the first meeting was the Mechanics Arts Bldg., on the North Texas Agricultural College campus, Arlington, Tex., with Professor M. C. Stone as the host. It was agreed that the club meet once every six weeks, for the purpose of presenting common problems for discussion and solution. Each member is to take part in the program to the extent of a five-minute period allotted to him.

The motive for organizing and meeting so frequently is to promote professional interests, and to work out knotty problems pressing for solution.

This club is open to all shop and drafting teachers in the North Texas section. The only requisite for membership is participation in the program. — *C. I. Linthicum.*

♦ The Third Annual Convention of the Texas Vocational Association was held March 29–30, at San Antonio, Tex.

The first general meeting held at 9:00 a.m. Friday was under the chairmanship of Mrs. Estelle H. Wallace, president of the Texas Vocational Association. Addresses at this meeting were made by Dr. L. A. Woods, state superintendent of public instruction, Austin; L. H. Dennis, executive secretary, American Vocational Association, Washington, D. C.; and Harold Gaulrapp, Master of the Texas Grange, Dallas.

The main speaker at the annual banquet was Dr. R. H. Montgomery, professor of economics, University of Texas, Austin.

The chairman at the Industrial Arts Section meeting on Saturday, 2:00 p.m., was H. K. Dodgen, head of industrial arts education and vocational education, Temple Public Schools, Temple.

Dr. Maris M. Proffitt, educational consultant and specialist in industrial education, U. S. Office of Education, Washington, D. C., at this meeting spoke on, "The Present Aims and Objectives of Industrial-Arts Education and How They Can Be Achieved in a Local Program," and Chris H. Groneman, East Texas State Teachers College, Commerce, presented his views on, "The Value of Industrial-Arts Education in the Junior High School."

A panel discussion on the topic, "Safety and Hygiene in the Industrial-Arts Laboratories" followed. The panel leader was Dr. Carl A. Nau, director, Division of Industrial Hygiene, State Board of Health, Austin, and the members of the panel were: E. L. Williams, Texas Agricultural and Mechanical College, College Station; T. Y. Collins, chief deputy, Bureau of Labor Statistics, Austin; and H. Miles, State Teachers College, San Marcus.

The chairman of the Industrial Education Section, Friday afternoon, was, M. C. Stone, head engineering and trades, North Texas Agricultural College, Arlington.

The addresses at this meeting were given by: Robert J. Smith, vice-president, Braniff Airways, Dallas; Herman H. Ochs, chairman, Board of Directors, Wolff and Marx Co., San Antonio; Dr. Maris M. Proffitt; and L. H. Dennis. The subjects discussed were: "Educational Needs of the Aviation Industry," "The Development of Desirable Social and Work Attitudes for Youth," "Ways by Which Industrial Arts and Commercial Education in Junior and Senior High Schools Can Supplement Trade and Industrial, Business, and Distributive Education," and "The Vocational Education Outlook from a National Viewpoint."

At the Vocational Guidance and Placement Section on Friday, p.m., the presiding officer was, Dr. Walter H. Adams, dean, Abilene Christian College, Abilene. Merrill Bishop, assistant director of education supervising guidance, Library and English, Secondary Division, San Antonio Public Schools, San Antonio, discussed, "Guidance in the Intermediate Grades," and Dr. James A. McCain, director of placement and public relations, Colorado State College, Fort Collins, Colo., spoke on "Guidance Returns to the Fold."

W. R. Cate, supervisor of industrial education, Austin, was the chairman at the Trade and Industrial Education Section on Saturday afternoon. The subjects discussed were: "The Superintendent Views Vocational Education," "Fitting Academic and Vocational Training into a School's Program," "The Relations of Vocational Education to the Industrialization of Texas," "The National Youth Administration Examines the Problem of Vocational Training," and "Vocational Training for N.Y.A. Enrollees at Inks Dam," and the speakers were: Superintendent William P. Galligan, Laredo; Walter J. E. Schiebel, principal, Dallas Technical High School, Dallas; Superintendent George P. Barron, Yoakum; Paul M. Heverly, resident supervisor, N.Y.A. Inks

(Continued on page 14A)

SHOP EQUIPMENT NEWS
NEW PRODUCTS—PUBLICATIONS

No. 399, 18 by 6-in. Single-Surface Planer

The Oliver Machinery Co., Grand Rapids Mich., have just marketed their new No. 399 single-surface planer.

It is very rigidly and stanchly built. The base, sides, and housings for the cylinder and upper roll bearings are cast in one piece. This assures perfect permanent alignment, and deep square-gibbed ways keep the table parallel.

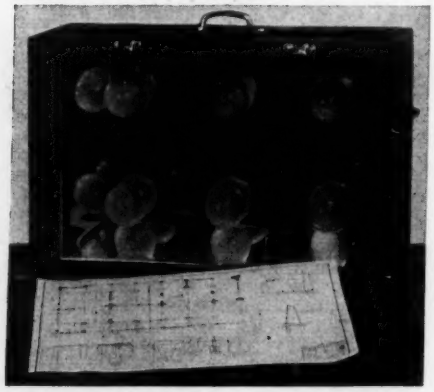
The cutterhead runs on ball bearings and the rolls on roller bearings, thus reducing friction to a minimum. All running parts are covered so that this easy-to-operate and silent-running planer also is extremely safe.

This planer, specially built for the school shop, takes care of lumber up to 18 in. wide and 6 in. thick. The cylinder is of the 3-knife, safety type. It is of extra heavy design, and runs in precision ball bearings. Feeds of 15 to 35 f.p.m. are available.

A 3 h.p. 3600 r.p.m. motor furnishes the power for the machine. An extra, motor-driven knife grinder for this planer also is available.

Elpro Portable Printer

A new Elpro Portable Printer has just been announced by the Ozalid Corp., Ansco Road, Johnson City, N. Y. This portable reproduction unit was designed to use positive printing, dry developing Ozalid sensitized papers and cloths.



The light source consists of six specially developed lamps. The case is finished in attractive gunmetal, and a highly polished aluminum reflector assures uniform light distribution over the printing surface. A new feature is a dry developing chamber, which is conveniently located behind the metal reflector; thus utilizing the heat generated by the lights to vaporize the developing agent. An additional feature is a time switch, which allows the operator to automatically regulate the length of exposure.

This is a light and portable unit, which can be carried from place to place, and used either in the office or in the field on the job. Since no moist surface developing solutions are used, no washing, fixing, or drying is required. The cost of making Ozalid prints on the Elpro Portable Printer is but a fraction of the cost of making such reproductions by other photocopy methods.

Lufkin Inside Micrometers

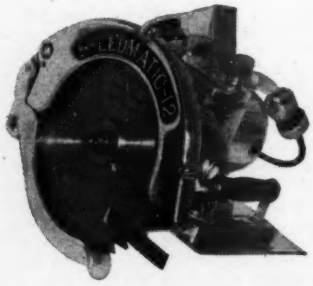
The Lufkin Rule Company has just placed on the market No. 80 Series Inside Micrometers. These are good micrometers, though substantially lower in price than the Lufkin No. 680 Series. They are designed for those mechanics not requiring various of the features found only in the No. 680 line.

In the No. 80 Inside Micrometers the range is obtained by use of extension rods and collars, No. 80A having six rods and a ½-in. collar and range from 2 to 8 in., while No. 80B has ten rods and a ½-in. collar and range from 2 to 12 in. Both have ½-in. movement of screw.

On these Inside Micrometers provision is made for adjusting tension and taking up wear on the screw. Contact points of the rods are adjustable for maintaining their individual length. All contact points are hardened and ground. A handle can be supplied on either one of these tools and either can be furnished with plush-lined case.

12-Inch Speedmatic Saws

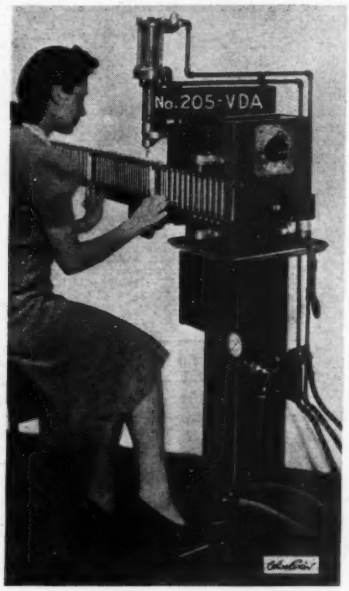
The Porter-Cable Machine Co. of Syracuse, N. Y., have announced their new 12-in. Speedmatic saws with 3-phase, 220-volt motors, thus equipping these electric hand saws with ample power for heavy-duty cutting. These Speedmatic saws have the following noteworthy features: high speed; lightweight; smooth finish; accurate cutting; guarded saw blade; one hand operation; guaranteed speed performance; 98 per cent efficient long-life gear drive; wrenchless angle and depth adjustments; convertible to table, radial, or cutoff saw; and to standard roundhole blades, dado cutters and abrasive disks.



The Porter-Cable Co. also produce a radial arm in which this Speedmatic may be used; thus this unit serves as an electric hand saw and as the power unit in an overarm saw unit capable of crosscutting and ripping any angle or compound angle.

Machine No. 205–VDA

The Eisler Engineering Company of Newark, N. J., has introduced a 5 KVA high-speed production Spot Welder. This welder is an air-operated, vertical-press-type machine supplied with a suitable automatic timer and contactor.



There are two operators for this welder, one to load the welding fixture and the other to operate the foot switch and slide the fixture along after each weld.

The objects shown in the photo are cylindrical-shaped tubes, to which small flat pieces of metal are being spot welded. The operator can attain a speed of 150 spots per minute.

This machine will easily adapt itself for many other types of spot-welding jobs.

"Running a Regal" and "March of the Masters"

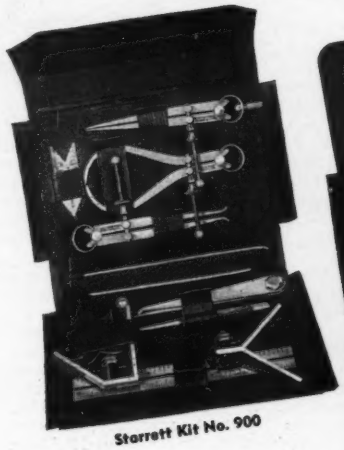
The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, manufacturers of Regal and Super Regal lathes, have just announced the completion of the following two books:

Running a Regal. This is the fourth edition, completely revised and supplied with new sketches and diagrams. It is a complete manual covering all phases of lathe operation and maintenance, and is a valuable aid to the apprentice machinist. Its 116 pages are filled with over 120 helpful illustrations.

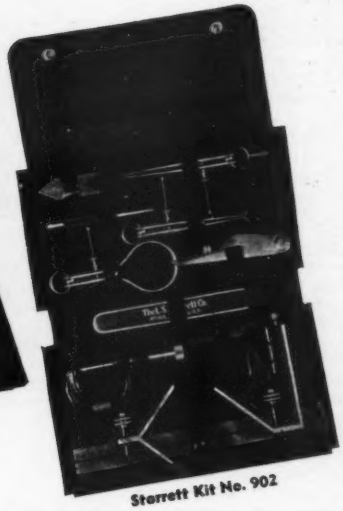
March of the Masters. This is an inspirational book for the young apprentice. It emphasizes the important part which the lathe has played in every important invention. The lathe was the starting point of the career of many a now important captain of industry, and these careers are all carefully noted in *March of the Masters.*

Both of these books, ordinarily sold at 25 cents a copy, are free to instructors who request them on their school letterhead. Requests should be addressed to The R. K. LeBlond Machine Tool Co. Dept. R-26, Edwards & Madison Road, Hyde Park, Cincinnati, Ohio.

YOUR idea of the RIGHT TOOLS for SHOP CLASSES



Starrett Kit No. 900



Starrett Kit No. 902

You may be one of the hundreds of instructors and supervisors who helped us select the tools in these Starrett Student Kits. Chosen as the most essential for work on modern shop class projects, the tools are all genuine Starretts, priced to fit the average school shop budget.

See these Starrett Kits and the many other tools designed for shop class use at your tool dealer's or write for Catalog No. 26-CE.

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

World's Greatest Toolmakers—Manufacturers of Hacksaws Unexcelled—Steel Tapes, Standard for Accuracy—Dial Indicators for Every Requirement

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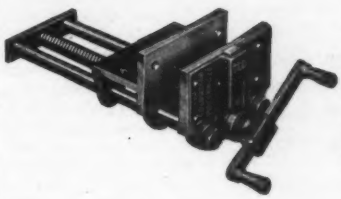
COLUMBIAN VISES



Columbian Continuous-screw Woodworker's vises are furnished with hard wood handles—or may be equipped with ADJUSTABLE STEEL HANDLES, as opposite, to eliminate handle breakage, speed operation and provide extra leverage.

Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

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(Continued from page 11A)

Dam Regional Center, Burnet; and N. B. Read, vocational supervisor, Inks Dam Regional Center, Burnet.

♦ The Thirteenth Annual Convention of the Michigan Industrial Education Society held at Detroit, April 18, 19, and 20, again was conducted with the verve and finish one has come to expect of these genial, hospitable, and efficient Michigan educators.

From the opening general session on Thursday evening at which President Thomas P. Garrity presided and at which Dr. R. O. Small, president of American Vocational Association, Inc., and state director of vocational education, Boston, Mass., was the main speaker, to the end of the Ship's program Saturday afternoon, there was such an unending series of well-conducted meetings that it is a sheer impossibility of pointing out which one of the sessions was the best.

The Friday morning sessions started with the administrators' banquet. This was followed by a vocational-education symposium under the direction of George H. Fern, director, State Board of Control for Vocational Education, Lansing, as chairman. The speakers on this occasion were John Reid, secretary-treasurer, Michigan Federation of Labor, Lansing; Edward Kosten, co-ordinator of apprentice training, Grand Rapids; Dr. Warren K. Layton, director, guidance and placement, Detroit public schools; Edward L. Cushman, chief of special services, Michigan State Employment Service, Detroit; Dr. George E. Myers, professor of vocational education, University of Michigan; and Dr. Vierling Kersey, superintendent of schools, Los Angeles, Calif.

Dr. R. O. Small had the difficult task of summarizing the viewpoints expressed by the various speakers.

Both the Epsilon Pi Tau fraternity and the Western State Teachers College alumni had luncheon meetings scheduled for Friday noon.

In the afternoon, there were divisional meetings devoted to industrial arts, trade and industrial education, adult education, apprentice training, small high schools, and rehabilitation.

At the Trade and Industrial Education Meeting, over which Dr. Frank W. Dalton, chief, Trade and Industrial Education Division, Lansing, presided, Dr. R. O. Small spoke on "The Responsibilities of the Vocational Director." On this same program Dr. C. G. Bender, of the Kellogg Foundation, gave an address on "The Effect of Thorough Training on Industrial Safety." The following participated in the discussion: Floyd L. Allen, director of vocational education, Saginaw; George W. Dean, vice-president, Michigan Federation of Labor, Detroit; Deyo B. Fox, principal, Technical High School, Jackson; Frank H. McCrea, principal, Wilson Vocational School, Muskegon; John Reid; Henry Roesch, director of personnel relations, Briggs Mfg. Co., Detroit; and G. F. Weber, director of industrial education, South Bend. To Frederick B. Searle, superintendent of Ford Schools, Dearborn, fell the important duty of summarizing the material that had been presented.

At the Industrial-Arts Meeting — Division 1, under the chairmanship of R. Vard Martin, director of industrial education, Dearborn, Dr. Vierling Kersey spoke on "Industrial Arts — A Part of, Not Apart from, All Education," and John Haine, personnel division, Chrysler Corp., Detroit, spoke on "Education in an Industrial Civilization." The participants in the discussion were: L. P. Arduser, representative, International Textbook Co., Scranton, Pa.; George F. DePuy, head of industrial-arts department, Central State Teachers College; Wayne B. McClintock, head of industrial-arts department, Northern State Teachers College; and Marion J. Sherwood, head of industrial-arts department, Western State Teachers College.

At the Industrial-Arts Division No. 3 Meeting, Marshall Byrn, assistant professor of vocational education, University of Michigan, functioned as chairman.

Luther Hail, head of industrial-arts department, Hutchins Intermediate School, Detroit, presented an excellent address on "Content Enrichment and Pupil Planning in Industrial-Arts Courses," and Arthur Dunham, instructor of industrial arts, Sherrill School, Detroit, spoke on "Modern Plastics as a Medium of Expression in Industrial Arts." He also exhibited beautiful work in plastics made by his students.

At the banquet, Friday evening, President Thomas P. Garrity presided and Dr. Frank Cody, superintendent of schools, Detroit, acted as toastmaster. Dr. Vierling Kersey gave an excellent address on, "Good Specialization in General Education."

The Cass Technical High School orchestra, the Cass Tech strolling singers, and the Hamtramck High School "light opera ensemble" deserve the highest credit for the outstanding entertainment which they furnished. The annual dance followed.

The Saturday sessions started bright and early with a breakfast meeting sponsored by Mu Sigma Pi.

The master of ceremonies for this occasion was Robert Howard, and the speaker, whose subject was "Leadership — What It Takes," was Dr. R. L. Lee, public-relations division, General Motors Corp.

At the M.I.E.S. Town Meeting Saturday morning, Dr. David D. Henry, acting executive vice-president, Wayne University, was chairman, and Thomas Diamond, associate professor of vocational education, University of Michigan, acted as moderator. The subject for discussion was "Should the Vocational Schools Provide Training for All Levels of Employment Skills?," and the speakers were John Reid; Robert G. Waldron, division of industrial relations, Hudson Motor Car Co., Detroit; and Dr. Verne C. Fryklund, associate professor and supervisor of vocational education, Wayne University.

Other sectional meetings on many and diverse interests of shop teachers, supervisors, and administrators were held and every one was well attended.

At the business meeting, C. E. Highlen was elected as president, Carl Karlstrom, vice-president, and Arthur L. Reagh, executive secretary-treasurer.

The place of the next meeting will be decided upon by the convention committee.

At the Ship's luncheon, Saturday at noon, C. E. Highlen, the newly elected president, presided. Earl L. Bedell, director of vocational education, Detroit, was toastmaster.

An honorary life-membership certificate was presented by the M.I.E.S. to Frank Roy Keppler as an acknowledgment of his outstanding contribution in the field of practical education in Michigan.

Major Norman A. Imrie, associate editor, *Columbus Dispatch*, Columbus, Ohio, spoke in his humorous, forcible manner on "What America Needs." John Claude, Bruce Publishing Co., Milwaukee, as Deck Officer of the Ship, then took over, and aided by other members of the crew, distributed the Ship's prizes.

Earl L. Bedell as chairman of the local committee, and his assistants, as well as all the officers of the M.I.E.S. deserve the highest compliments for the success of the 1940 convention. The registration was 650.

♦ The March meeting of the Long Island Industrial Arts Teachers Association was held at the High School, Great Neck, N. Y., with Herbert L. Gregory, supervisor of industrial arts, as host.

Approximately fifty teachers assembled from 7:00 to 8:30 o'clock for the inspection of general shops in wood, metal, printing, mechanical drawing I, II, III, IV, and industrial arts for elementary grades.

A book display of latest releases on shop problems and texts was held by Mr. James E. McGinley, local representative of the Bruce Publishing Company. A demonstration was also given on the Mimeograph Photographic Printer.

Greetings to association members was extended by Mr. Milford Franks, principal of Great Neck High School, after which refreshments were served in the school cafeteria. A novelty entertainment was presented by some of the members, ending with group singing.

The regular business meeting followed with president John F. Heikkila presiding. In keeping with the association policy of helping each other,

(Continued on page 17A)

. . . products of SpeedWay, for 30 years manufacturers of electric tools. Specially wound high torque 110 V universal tool motors. Im-speeds. 1000 RPM Drill proved designs — correct with die cast handle has ¼" capacity in steel. 20,000 RPM Hand Grinder has speed es-sential for efficiency and collets for both ¼" and 3/32" arbors. Drill and Grind-er sold singly or together with 5 accessories in fitted Steel Kit. Stand takes either drill or grinder. Router Frame converts grinder into router. Bench Grinder is complete with motor. Ad-justable rests, rubber feet and cord. Write for Circulars.

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(Continued from page 14A)

fifty sheets of related information, numerous plans and patterns for shop libraries were distributed free to the members of the association.

At the February meeting held at the Bay Shore Junior-Senior High School, Mr. Roy Fales, state supervisor of industrial arts of the State Education, Albany, N. Y., spoke on "Adapting Industrial Arts to the Needs of Society."

♦ The Ninth Annual Convention of the Indiana Industrial Education Association was held at Richmond on April 5 and 6.

The following officers were elected for the coming year: president, Marvel Moore, Richmond; vice-president, Virgil Fleenor, Kokomo; and secretary-treasurer, H. G. McComb, Purdue University, W. Lafayette.

Richmond proved an interesting host to the teachers of industrial education. The program and the industrial visits held the attention of all.

The executive committee of the association met for a preliminary meeting on Thursday evening on the call of State Supervisor Allen T. Hamilton and President E. T. Organ. Detailed plans for the improvement of the district meetings and for the publication of a handbook to explain the purposes of the association were reviewed.

At the first general session, Dr. Lynn A. Emerson, professor of industrial education, Cornell University, presented a plea for an education and training for all, including the skilled and semiskilled. He was followed by Rodney H. Brandon, former state director, Department of Public Welfare of Illinois, who commented as follows: "Emerson has made a perfect setting for my plea for a complete education including hand training for all." Brandon pointed out that very few skilled and trained men were in prison.

John F. Friese, associate professor of industrial education, Pennsylvania State College, gave a fine luncheon talk emphasizing in a different way the need for semiskilled training and putting the challenge up to industrial arts to undertake this training. — *H. G. McComb.*

♦ At its April meeting the School Crafts Club of New York City conducted a series of round-table discussions. Mr. Michael Dank, instructor at the Universal School of Handicrafts, spoke on "New Techniques and Materials in Educational Crafts." Mr. George Seaman, chairman of the mechanics arts department, Manual Training School, Perth Amboy, N. J., discussed "Photography as a High School Subject in Manual Training." A résumé on "Marquetry" was given by Mr. Harvey E. Parry of Manual Training High School, Brooklyn, N. Y. Mr. John Hulstrunk of the Essex County (N. J.) Vocational School System, assisted by his young son Bill, gave a discussion and demonstration of model airplanes. The last speaker was Mr. P. L. Schneider, a New York City teacher, who talked on "Model Sailing Boats."

At the next meeting, May 18, Mr. Morris E. Siegel, Director of Vocational and Continuation Schools, New York City, will speak on "Current Trends in Vocational Education and Industrial Arts." Dinner at 6:30 p.m.; meeting at 8 p. m.; Hotel Imperial. — *Harvey E. Parry.*

New Publications

Dictionary of Technical Terms

By F. S. Crispin. Cloth, 327 pages, 5½ by 8. Price, $2.25. Published by The Bruce Publishing Co., Milwaukee, Wis.

This is the third revision and enlargement of this exceptionally handy book. More than a thousand new words, and six new classifications have been added.

The classifications covered are: advertising, art metal, ceramics, color, geology, plastic art (new), aeronautics, agriculture, algebra, architecture, arithmetic, art, auto mechanics, building, bookbinding, botany, cabinetwork, carpentry, chemistry, drafting, drawing, dyeing, electricity, engineer-

(Continued on page 19A)

THE WINNERS

in the Broadhead-Garrett

250-word essay

CONTEST

on the subject "WHY I PREFER 'SOFT TEXTURE' KILN DRIED LUMBER FOR USE IN MY CLASSES"

after long, careful consideration are announced by Contest Judges: Allen D. Backus (Director of Practical Arts Board of Education, Newark, N. J.), Prof. Paul E. Harrison (State Teachers College, De Kalb, Ill.), and Dr. William E. Warner (Prof. of Education, Ohio State Univ., Columbus, Ohio) as follows:

1st Prize — $100.00

Dave D. Ackerman, Union High School, Chesaning, Mich.

2nd Prize — $75.00

Irving F. Carney, High School, King's Mills, Ohio.

3rd Prize — $50.00

H. R. Brill, Township High School, Belleville, Ill.

4th Prize — $25.00

Harold W. Porter, Vocational School, Two Rivers, Wis.

Six $10.00 Merchandise Prizes:

Thomas L. Hutchinson, High School, Johnson City, N. Y.

Hester B. Newey, 15A. Stimson St., Kittery, Me.

Harold M. Gray, 627 Parallel St., Kansas City, Kan.

J. Perry Brett, High School, DuBois, Pa.

George N. Shower, High School, Taneytown, Md.

Victor F. Patterson, High School, Hilliards, Ohio.

●

Our congratulations to each of you (your prizes are in your hands by now) — and our sincerest thanks to the thousands of other contestants from thirty-three states, all of whose letters were good and whose expressions were gratefully received. Sorry we couldn't give prizes to all. Better luck next time.

BROADHEAD-GARRETT CO.

Specializing in Soft Texture Lumber and General School Supplies

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CRAFT SUPPLIES

Tooling Leather, Bending Jigs, Archery Supplies, Pewter, Art Metal Tools, Speedway Grinders and Drills, Woodburning Pens. New Paint Spray complete with Motor Compressor and Spray Gun, $9.95

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By W. Ben Hunt and John J. Metz

Shows beginners how to make flat bows, bowstrings, arrows, etc., illustrating the various processes. Also gives instructions for shooting.

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For Sloyd and Manual Training work, there are no finer knives made than Robert Murphy's. Over 90 years of experience, research and experimentation enable us to offer knives of guaranteed quality.

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AYER, Established 1850 MASS.

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18 Models for Woodwork only
2 Actions — 3 Sizes
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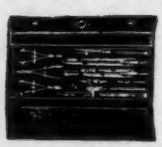

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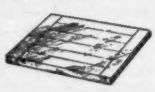

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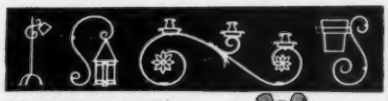

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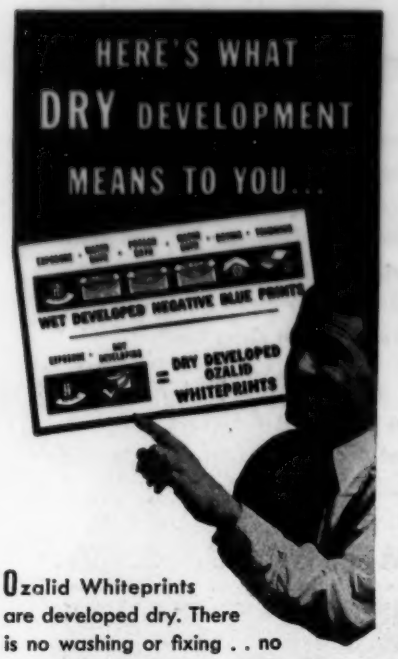

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(Continued from page 11A)

Dam Regional Center, Burnet; and N. B. Read, vocational supervisor, Inks Dam Regional Center, Burnet.

♦ The Thirteenth Annual Convention of the Michigan Industrial Education Society held at Detroit, April 18, 19, and 20, again was conducted with the verve and finish one has come to expect of these genial, hospitable, and efficient Michigan educators.

From the opening general session on Thursday evening at which President Thomas P. Garrity presided and at which Dr. R. O. Small, president of American Vocational Association, Inc., and state director of vocational education, Boston, Mass., was the main speaker, to the end of the Ship's program Saturday afternoon, there was such an unending series of well-conducted meetings that it is a sheer impossibility of pointing out which one of the sessions was the best.

The Friday morning sessions started with the administrators' banquet. This was followed by a vocational-education symposium under the direction of George H. Fern, director, State Board of Control for Vocational Education, Lansing, as chairman. The speakers on this occasion were John Reid, secretary-treasurer, Michigan Federation of Labor, Lansing; Edward Kosten, co-ordinator of apprentice training, Grand Rapids; Dr. Warren K. Layton, director, guidance and placement, Detroit public schools; Edward L. Cushman, chief of special services, Michigan State Employment Service, Detroit; Dr. George E. Myers, professor of vocational education, University of Michigan; and Dr. Vierling Kersey, superintendent of schools, Los Angeles, Calif.

Dr. R. O. Small had the difficult task of summarizing the viewpoints expressed by the various speakers.

Both the Epsilon Pi Tau fraternity and the Western State Teachers College alumni had luncheon meetings scheduled for Friday noon.

In the afternoon, there were divisional meetings devoted to industrial arts, trade and industrial education, adult education, apprentice training, small high schools, and rehabilitation.

At the Trade and Industrial Education Meeting, over which Dr. Frank W. Dalton, chief, Trade and Industrial Education Division, Lansing, presided, Dr. R. O. Small spoke on "The Responsibilities of the Vocational Director." On this same program Dr. C. G. Bender, of the Kellogg Foundation, gave an address on "The Effect of Thorough Training on Industrial Safety." The following participated in the discussion: Floyd L. Allen, director of vocational education, Saginaw; George W. Dean, vice-president, Michigan Federation of Labor, Detroit; Deyo B. Fox, principal, Technical High School, Jackson; Frank H. McCrea, principal, Wilson Vocational School, Muskegon; John Reid; Henry Roesch, director of personnel relations, Briggs Mfg. Co., Detroit; and G. F. Weber, director of industrial education, South Bend. To Frederick B. Searle, superintendent of Ford Schools, Dearborn, fell the important duty of summarizing the material that had been presented.

At the Industrial-Arts Meeting — Division 1, under the chairmanship of R. Vard Martin, director of industrial education, Dearborn, Dr. Vierling Kersey spoke on "Industrial Arts — A Part of, Not Apart from, All Education," and John Haine, personnel division, Chrysler Corp., Detroit, spoke on "Education in an Industrial Civilization." The participants in the discussion were: L. P. Arduser, representative, International Textbook Co., Scranton, Pa.; George F. DePuy, head of industrial-arts department, Central State Teachers College; Wayne B. McClintock, head of industrial-arts department, Northern State Teachers College; and Marion J. Sherwood, head of industrial-arts department, Western State Teachers College.

At the Industrial-Arts Division No. 3 Meeting, Marshall Byrn, assistant professor of vocational education, University of Michigan, functioned as chairman.

Luther Hail, head of industrial-arts department, Hutchins Intermediate School, Detroit, presented an excellent address on "Content Enrichment and Pupil Planning in Industrial-Arts Courses," and Arthur Dunham, instructor of industrial arts, Sherrill School, Detroit, spoke on "Modern Plastics as a Medium of Expression in Industrial Arts." He also exhibited beautiful work in plastics made by his students.

At the banquet, Friday evening, President Thomas P. Garrity presided and Dr. Frank Cody, superintendent of schools, Detroit, acted as toastmaster. Dr. Vierling Kersey gave an excellent address on, "Good Specialization in General Education."

The Cass Technical High School orchestra, the Cass Tech strolling singers, and the Hamtramck High School "light opera ensemble" deserve the highest credit for the outstanding entertainment which they furnished. The annual dance followed.

The Saturday sessions started bright and early with a breakfast meeting sponsored by Mu Sigma Pi.

The master of ceremonies for this occasion was Robert Howard, and the speaker, whose subject was "Leadership — What It Takes," was Dr. R. L. Lee, public-relations division, General Motors Corp.

At the M.I.E.S. Town Meeting Saturday morning, Dr. David D. Henry, acting executive vice-president, Wayne University, was chairman, and Thomas Diamond, associate professor of vocational education, University of Michigan, acted as moderator. The subject for discussion was "Should the Vocational Schools Provide Training for All Levels of Employment Skills?," and the speakers were John Reid; Robert G. Waldron, division of industrial relations, Hudson Motor Car Co., Detroit; and Dr. Verne C. Fryklund, associate professor and supervisor of vocational education, Wayne University.

Other sectional meetings on many and diverse interests of shop teachers, supervisors, and administrators were held and every one was well attended.

At the business meeting, C. E. Highlen was elected as president, Carl Karlstrom, vice-president, and Arthur L. Reagh, executive secretary-treasurer.

The place of the next meeting will be decided upon by the convention committee.

At the Ship's luncheon, Saturday at noon, C. E. Highlen, the newly elected president, presided. Earl L. Bedell, director of vocational education, Detroit, was toastmaster.

An honorary life-membership certificate was presented by the M.I.E.S. to Frank Roy Keppler as an acknowledgment of his outstanding contribution in the field of practical education in Michigan.

Major Norman A. Imrie, associate editor, *Columbus Dispatch*, Columbus, Ohio, spoke in his humorous, forcible manner on "What America Needs." John Claude, Bruce Publishing Co., Milwaukee, as Deck Officer of the Ship, then took over, and aided by other members of the crew, distributed the Ship's prizes.

Earl L. Bedell as chairman of the local committee, and his assistants, as well as all the officers of the M.I.E.S. deserve the highest compliments for the success of the 1940 convention. The registration was 650.

♦ The March meeting of the Long Island Industrial Arts Teachers Association was held at the High School, Great Neck, N. Y., with Herbert L. Gregory, supervisor of industrial arts, as host.

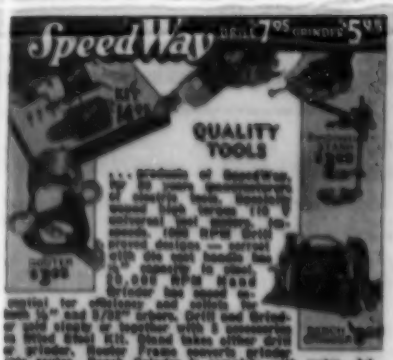
Approximately fifty teachers assembled from 7:00 to 8:30 o'clock for the inspection of general shops in wood, metal, printing, mechanical drawing I, II, III, IV, and industrial arts for elementary grades.

A book display of latest releases on shop problems and texts was held by Mr. James E. McGinley, local representative of the Bruce Publishing Company. A demonstration was also given on the Mimeograph Photographic Printer.

Greetings to association members was extended by Mr. Milford Franks, principal of Great Neck High School, after which refreshments were served in the school cafeteria. A novelty entertainment was presented by some of the members, ending with group singing.

The regular business meeting followed with president John F. Heikkila presiding. In keeping with the association policy of helping each other,

(Continued on page 17A)



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(Continued from page 14A)

fifty sheets of related information, numerous plans and patterns for shop libraries were distributed free to the members of the association.

At the February meeting held at the Bay Shore Junior-Senior High School, Mr. Roy Fales, state supervisor of industrial arts of the State Education, Albany, N. Y., spoke on "Adapting Industrial Arts to the Needs of Society."

♦ The Ninth Annual Convention of the Indiana Industrial Education Association was held at Richmond on April 5 and 6.

The following officers were elected for the coming year: president, Marvel Moore, Richmond; vice-president, Virgil Fleenor, Kokomo; and secretary-treasurer, H. G. McComb, Purdue University, W. Lafayette.

Richmond proved an interesting host to the teachers of industrial education. The program and the industrial visits held the attention of all.

The executive committee of the association met for a preliminary meeting on Thursday evening on the call of State Supervisor Allen T. Hamilton and President E. T. Organ. Detailed plans for the improvement of the district meetings and for the publication of a handbook to explain the purposes of the association were reviewed.

At the first general session, Dr. Lynn A. Emerson, professor of industrial education, Cornell University, presented a plea for an education and training for all, including the skilled and semiskilled. He was followed by Rodney H. Brandon, former state director, Department of Public Welfare of Illinois, who commented as follows: "Emerson has made a perfect setting for my plea for a complete education including hand training for all." Brandon pointed out that very few skilled and trained men were in prison.

John F. Friese, associate professor of industrial education, Pennsylvania State College, gave a fine luncheon talk emphasizing in a different way the need for semiskilled training and putting the challenge up to industrial arts to undertake this training. — *H. G. McComb.*

♦ At its April meeting the School Crafts Club of New York City conducted a series of round-table discussions. Mr. Michael Dank, instructor at the Universal School of Handicrafts, spoke on "New Techniques and Materials in Educational Crafts." Mr. George Seaman, chairman of the mechanics arts department, Manual Training School, Perth Amboy, N. J., discussed "Photography as a High School Subject in Manual Training." A résumé on "Marquetry" was given by Mr. Harvey E. Parry of Manual Training High School, Brooklyn, N. Y. Mr. John Hulstrunk of the Essex County (N. J.) Vocational School System, assisted by his young son Bill, gave a discussion and demonstration of model airplanes. The last speaker was Mr. P. L. Schneider, a New York City teacher, who talked on "Model Sailing Boats."

At the next meeting, May 18, Mr. Morris E. Siegel, Director of Vocational and Continuation Schools, New York City, will speak on "Current Trends in Vocational Education and Industrial Arts." Dinner at 6:30 p.m.; meeting at 8 p. m.; Hotel Imperial. — *Harvey E. Parry.*

New Publications

Dictionary of Technical Terms

By F. S. Crispin. Cloth, 327 pages, 5½ by 8. Price, $2.25. Published by The Bruce Publishing Co., Milwaukee, Wis.

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The classifications covered are: advertising, art metal, ceramics, color, geology, plastic art (new), aeronautics, agriculture, algebra, architecture, arithmetic, art, auto mechanics, building, bookbinding, botany, cabinetwork, carpentry, chemistry, drafting, drawing, dyeing, electricity, engineer-

(Continued on page 19A)

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after long, careful consideration are announced by Contest Judges: Allen D. Backus (Director of Practical Arts Board of Education, Newark, N. J.), Prof. Paul E. Harrison (State Teachers College, De Kalb, Ill.), and Dr. William E. Warner (Prof. of Education, Ohio State Univ., Columbus, Ohio) as follows:

1st Prize — $100.00

Dave D. Ackerman, Union High School, Chesaning, Mich.

2nd Prize — $75.00

Irving F. Carney, High School, King's Mills, Ohio.

3rd Prize — $50.00

H. R. Brill, Township High School, Belleville, Ill.

4th Prize — $25.00

Harold W. Porter, Vocational School, Two Rivers, Wis.

Six $10.00 Merchandise Prizes:

Thomas L. Hutchinson, High School, Johnson City, N. Y.

Hester B. Newey, 15A. Stimson St., Kittery, Me.

Harold M. Gray, 627 Parallel St., Kansas City, Kan.

J. Perry Brett, High School, DuBois, Pa.

George N. Shower, High School, Taneytown, Md.

Victor F. Patterson, High School, Hilliards, Ohio.

Our congratulations to each of you (your prizes are in your hands by now) — and our sincerest thanks to the thousands of other contestants from thirty-three states, all of whose letters were good and whose expressions were gratefully received. Sorry we couldn't give prizes to all. Better luck next time.

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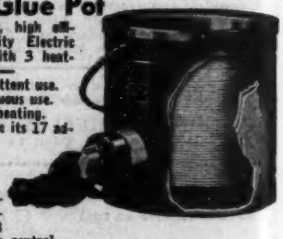

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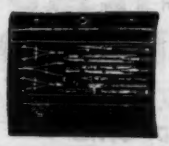

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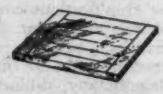

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